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Information systems for the city of New York

Touche, Ross, Bailey & Smart

INFORMATION SYSTEMS FOR THE CITY OF NEW YORK

VOLUME I AN ACTION PROGRAM FOR MANAGEMENT – EXECUTIVE SUMMARY

May, 1969

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August 8, 1969

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Dear Sirs:

The attached report, Information Systems for the City of New York: An Action Program for Management - Executive Summary, contains our recommendations to the City of New York which we formulated in the Information Systems Action Program Project. The submission of this report completes our work under contract 207577, as amended.

Although the attached report is based upon work accomplished by a joint project team assisted by Touche, Ross, Bailey & Smart, this document does not represent the consensus of the Project Steering Committee. The Committee has specifically subscribed to the following segments of the Summary: Chapter I, "Project Objectives, Organization and Scope"; the statement of organization alternatives in Chapter III, "Organization of Central Data Processing Functions"; Chapter VIII, "Data Processing Personnel Program"; and Chapter IX, "Data Processing Standards Program." The remainder of the report contains a number of findings, interpretations and recommendations on which there was not a consensus. It was not practical within the constraints of the project to clearly identify, resolve or present alternative findings, interpretations and recommendations for the items for which there was not consensus. Instead, on the basis of our study and broad experience with data processing in government and industry, we proceeded independently to make a professional presentation.

The recommendations on organization for central data processing functions are clearly labeled "Consultants' Analysis and Recommendations" to identify them in the report that contains the efforts of others.

SUMMARY OF THE PROBLEM

The City of New York is one of the largest users of data processing in government. It has 29 computers, approximately 1,200 data processing employees, and spends $21 million annually for data processing. If all non-mayoral agencies are included, there are 89 computers. The City's data processing costs have almost doubled since 1965. In the next five years, annual costs can be expected to rise to $35-40 million.

Although the City is heavily committed to data processing, the present Administration inherited an obsolete data processing structure which had not kept pace with earlier technological changes. Nonetheless, the City advanced beyond conventional clerical and bookkeeping uses which characterized the early days of computers. It is starting to apply its computers directly to improve public services by using them for faster dispatching of police cars, finding jobs for the unemployed, drilling students in arithmetic, monitoring air quality and speeding the flow of traffic. But the accomplishments are minor in comparison to the City's needs and to the potential of data processing.

It is our opinion that in spite of multi-million dollar expenditures for data processing, the City has very limited capability to effectively define, manage, and control the data processing services it performs and those for which it contracts.

- Computer applications are fragmented and unrelated to any general plan; there are still cases where computer prepared reports are laboriously transcribed by hand into ledgers.

- Agencies are unable to provide even the most rudimentary information on their data processing status or expenditures, or on their short-term plans.

- Effective utilization of the City's computers is well below their realizable potential.

- The lack of standards for all aspects of data processing from feasibility studies to programming languages contributes to the slow progress of the City in upgrading its data processing operations.

- Most of the City's data processing personnel are inexperienced in modern computer technology and lack management direction.

- The Civil Service data processing personnel structure is obsolete and inhibits recruiting and retaining appropriate personnel.

- Despite the close physical proximity of the City's computers, there has been virtually no data processing consolidation.

- The City has been vulnerably dependent on computer vendors in planning its computer uses.

- Computer equipment is procured predominately from a single vendor.

- The City has gotten into the position of making "creeping hardware commitments" by purchasing small computers which will rapidly be outgrown.

- The work areas for data processing management and professional personnel are below industry norms in terms of cleanliness, lighting, spaciousness, and furnishing.

The City's problems with data processing have not been unobserved. For example, the Citizens Union and the Citizens Budget Commission have made public reference to the City's data processing inadequacies. In addition, numerous newspaper items have referred to shortcomings in the City's data processing activities.

In the past five years, leading governments and corporations took steps to tackle these common and difficult problems but the City of New York did not. Examples include Federal government, New York State, Pennsylvania, Colorado, Washington, Vermont, Virginia, Illinois, Chicago, Los Angeles, San Francisco, Mobil Oil, Union Carbide, U.S. Steel, and Westinghouse.

Some studies have been made of the City's data processing. However, recommendations such as those made by the Temporary Commission on City Finances in 1966 remain largely unimplemented. The need for action is highlighted by the fact that no central data processing service center has been established although the Craco report and Council legislation, requested by the Mayor, provide for one.

There is a continuing need for substantial improvement in fundamental areas of data processing: personnel policies and practices; training; organization and staffing; standards; systems planning, development and control. In our opinion, the most significant impediment to the City's effective use of computer-based information technology is the lack of clearly defined central data processing responsibility. Consequently, of the major recommendations very briefly summarized below, organization of central data processing functions requires most immediate attention.

SUMMARY OF RECOMMENDATIONS

ORGANIZATION OF CENTRAL DATA PROCESSING FUNCTIONS

1. Establish a central staff group in the Office of Administration for Information Systems Planning. The group, analogous to a "corporate systems group" would:

- develop and maintain a comprehensive data processing plan;
- monitor and, as appropriate, control the implementation of data processing plan;
- provide data processing technical staff support to all City agencies;
- guide agencies on policy matters which involve computer technology;
- represent the City of New York on matters involving data processing including intergovernmental coordination;
- serve as a central source of information in City data processing activities

Its authority would include the power to approve or disapprove requests for data processing equipment, services, and personnel.

Establish a Data Processing Development Fund This would be administered by the Information Systems Planning group The PU-16 capital budget fund now appropriated to the Department of Purchase for computer purchases should be appropriated instead to the Office of Administration as part of the Data Processing Development Fund.

2. Establish a Central Data Processing Service Center in the Municipal Services Administration (MSA) ~~legislation~~. Data Processing Services to be offered are:

- computer operations
- systems analysis
- programming
- data entry
- auxiliary operations (printing, bursting, collating, tape and disk cleaning, etc)
- controlling the brokerage of City agencies' excess computer time
- centralized computer time-sharing services for engineering and analytical personnel throughout the City
- future centralized computer switching of data and message communications

Agencies to be serviced initially would include:

- Environmental Protection
- Municipal Services
- Economic Development
- Transportation
- Board of Elections
- Consumer Affairs
- City Planning
- Office of Administration
- Executive Office

In addition to avoiding high costs and achieving much better performance compared to alternate methods of satisfying the data processing needs of these agencies, estimated annual savings from implementing this recommendation are in the range of $200,000 to $500,000

Charge City agencies at standard rates for Data Processing Service Center services and, aside from an initial subsidy, make the Center dependent on such revenues for its survival.

Provide City agencies a choice of buying services from the Central Data Processing Service Center or from commercial sources, thereby introducing the element of competition as a spur to good service.

3. Formalize the Information Systems Policy Advisory Council, composed of policy-level representatives from the Executive Office, Office of Administration, and Bureau of the Budget. Its informal authority is significant. As a policy advisory group to the Mayor and the central data processing groups, it can do much to provide policy direction and coordination in the City data processing activities.

4. Formalize the Technical Advisory Panel on Information Systems. Created unofficially by the Office of Administration, it is composed of top-level computer executives from major corporations and institutions in New York City and provides access to a great wealth of computer knowledge outside City government.

5. Establish a central staff group in the Bureau of the Budget for Citywide Internal Data Systems. It would plan and guide the coordinated development of those Citywide data systems, interdepartmental in nature, which are required for managing the City's internal resources. These data systems are:

- Dollar Data Systems (revenue, accounting, budgeting)
- Personnel Data Systems (classification, testing, employee history, skills inventory, position control, payroll, retirement)
- Physical Resource Data Systems (requisition, purchase, receipt, inventory, payment and issuance of supplies and equipment) (inventory and control of City space and land)

Place high priority on developing the Personnel Data Systems.

6. Establish a central staff group in the Office of Administration for Citywide External Data Systems. It would plan and guide the coordinated development of those Citywide data systems, interdepartmental in nature, which are required for conducting transactions between the City government and the public. These data systems are:

- Real Property Data Systems (e.g., GIST - Geographic Information SysTem)
- People Data System

Develop a standard way to identify people so that data can be accurately linked to the right person.

NON-CENTRAL DATA PROCESSING FUNCTIONS -- STRAGETIC DEPLOYMENT AND ORGANIZATION OF DATA PROCESSING RESOURCES

7. Integrate major computer applications into planned information systems which are based on public service programs. The recent consolidation of City agencies within public service program groupings significantly reduces the organizational barrier which would otherwise greatly inhibit developing information systems of broad enough scope to effectively support the City's major public service programs.

8. Adopt a policy of limited centralization of Data Processing resources. The limited centralization would include:

- Agencies having their own systems development and computer operations group: Finance; Police; Housing and Development; Health Services; Human Resources; Comptroller; Bureau of the Budget; and Judicial Conference

- Agencies having only systems development groups and using Municipal Services for computer operations: Fire; Environmental Protection; Transportation; City Planning; Office of Administration; and Personnel.

- Agencies obtaining any systems development services they may require and all their computer operations services from Municipal Services: Economic Development; Correction; Protection; Parks, Recreation and Cultural Affairs; Transportation; Consumer Affairs; and all mayoral staff agencies not included in the two previous groupings.

Organize Administrations (and Departments) which have systems development groups, so that the group reports no lower than to Deputy or Assistant Administrators (Commissioners).

Place highest priority on helping Administrations to organize and staff appropriately to carry out their data processing responsibilities. The Information Systems Planning group in the Mayor's staff agency can be more effective if it has confidence in the technical competence of the Administration's staff.

DATA PROCESSING PERSONNEL PROGRAM

9. Provide data processing personnel classifications, career paths, and salary structure in the Civil Service which will reflect new requirements associated with advancing data processing technology.

Establish the following positions:

1. Computer Systems Analysis series (separate from the Computer Programming series).
2. Computer Software Systems Analysis
3. Two supervisory levels in the Programming series
4. A Senior Computer Operator Supervisor.
5. A special Clerical title, Senior Clerk (Data Processing).
6. Two supervisory levels in the EAM Equipment Operator series
7. Supervising Keystroke Operator.

Provide an entrance salary for the Computer Systems Analysis series above the level for entrance into the Programming series.

Provide alternate paths of promotion.

1. from Programming to Computer Systems Analysis.
2. from Programming to Computer Software Systems Analysis.

3. from Computer Operations to Computer Programming series.

4. from Senior Clerk (Data Processing) to the Computer Operator series as well as to the higher level non-data processing clerical series.

Lower the education eligibility requirements from college degree to high school diploma for entrance into the Programming series.

Permit a Computer Operator Supervisor to function as either Shift Supervisor or Data Control Supervisor.

Replace obsolete titles which have a separate IBM or Univac designation

1. Substitute undifferentiated Supervisor EAM Equipment and Tab Operator titles.

2. Replace vendor-oriented key punch titles with undifferentiated Keystroke Operator Titles.

10. Recruit data processing personnel more aggressively and efficiently. Extend the reach of data processing personnel recruiting efforts by:

1. Expanding general on-campus and professional data processing organization recruiting to make students with an interest in data processing and data processing professionals aware of the City of New York's data processing career opportunities

2. Undertaking on site high school and community college recruiting to acquaint these students with lowered entrance requirements for programming positions

3. Giving consideration to programs for the disadvantaged as a source of keystroke and computer operators

4. Expanding advertising media used to include business, data processing professional, and computer trade publications.

5. Encouraging data processing line managers and all data processing personnel to become involved in the data processing recruiting effort. Their objective should be to sell the merits of City employment as well as to assist in the evaluation of candidates.

Improve the efficiency of the examination processes by:

1 Continuing to improve examining and certifying process to further close the time gap between initial contact and appointment.

2. Holding open competitive examinations concurrently with promotion examinations.

3. Holding walk-in examinations and modifying the testing process to permit greater use of unassembled examinations.

4. Establishing large panels of qualified examiners from which to draw, on short notice, small panels needed to conduct walk-in and unassembled examinations.

11. Provide a comprehensive data processing training program to all City agencies.

Develop and implement a continuing program of regular data processing training courses directed to teaching and updating skills of all levels of data processing personnel as well as non-data processing managers who are, or may become, data processing users.

Coordinate courses offered by equipment vendors and the Department of Personnel with specially developed courses as outlined in this report.

Encourage individual participation in voluntary and after-work hours education programs.

Provide funds to enable attendance at professional conferences, workshops, and seminars.

12. Maintain a data processing personnel plan

Conduct an annual comprehensive review of Citywide data processing personnel requirements, position classifications, salary ranges, alternate career paths, and recruiting program and their effectiveness.

Assign responsibility to the recommended Information Systems Planning group for planning and carrying out the annual reviews listed above, and for working with the Department of Personnel, Bureau of the Budget, and other relevant City agencies to implement whatever changes are required.

DATA PROCESSING STANDARDS PROGRAM

13. Implement the data processing standards described in the Data Processing Standards Manual which was developed as part of this project. These standards are designed to cover:

- policies
- procedures: sequence of events to be followed in systems development, operation, program maintenance, and equipment acquisition.
- documentation: the information to record during the above activities
- methodology: analytical techniques to be used in systems studies, choice of computer programming languages, and economic evaluation.

Assign responsibility for managing a continuous Data Processing Standards Program to the Information Systems Planning group.

IMPLEMENTING THE ACTION PROGRAM

14. Give highest priority to organizing for central data processing functions. Other action steps are dependent upon resolution of the organization responsibility. The Mayor should execute appropriate executive orders, administrative directives and funding requests to establish the organization and to assign responsibilities for:

- Information Systems Planning Group
- Citywide Data Systems Groups
- Central Data Processing Service Center
- New York Information Systems Policy Advisory Council
- Technical Advisory Panel on Information Systems

Agencies discharge the responsibilities described in the project reports and assigned to them by the actions of the Mayor.

The preceding recommendations constitute the Information Systems Action Program for the City of New York – a program designed to overcome the data processing problems identified above. Considering the size and complexity of the City, it should be understood that the use of representations from the City employees and of documents and reports relating to the historical development of the data processing function in the City was essential to timely completion of this project. Our assessment of the reliability to this data was based on our independent observations and professional judgement.

Recommendations on which there is a Project Steering Committee consensus have been partially implemented and are an advance in the City's continuing application of modern management methods to the complex problems of governing the City of New York.

Our Management Services staff has performed review and analysis procedures necessary with respect to the conclusions we express herein, but such procedures should neither be considered as audit in scope nor the conclusions as expressing an audit opinion under generally accepted auditing standards.

We will be pleased to meet with you, at your convenience, to discuss the attached report.

Very truly yours,

Touche, Ross, Bailey & Smart

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I. PROJECT OBJECTIVES, ORGANIZATION AND SCOPE

As a major step toward improved application of computer-based information technology to the government of the City, the Information Systems Action Program Project was initiated in 1968.

As defined in the original project plan, the project objectives were:

1. To develop a plan and action program for the City of New York for the effective and economical utilization of computer technology.

2. To specify major plan elements to implement the action program.

3. To help establish the environment essential for management to accept and to implement the action program.

PROJECT ORGANIZATION AND DOCUMENTATION

A Project Steering Committee consisting of the representatives from the three offices of the Mayor (Office of Administration, Bureau of the Budget and Executive Office) jointly administered the Project. The consulting firm of Touche, Ross, Bailey & Smart and the Management Sciences Unit of the Office of Administration, referred to in this report as "Project Staff," provided major staff support. In addition, resource personnel were assigned to the project by the Bureau of the Budget. For specific project activities such as the data processing (DP) questionnaires, DP personnel and DP standards activities, personnel were utilized from various agencies on a task force basis.

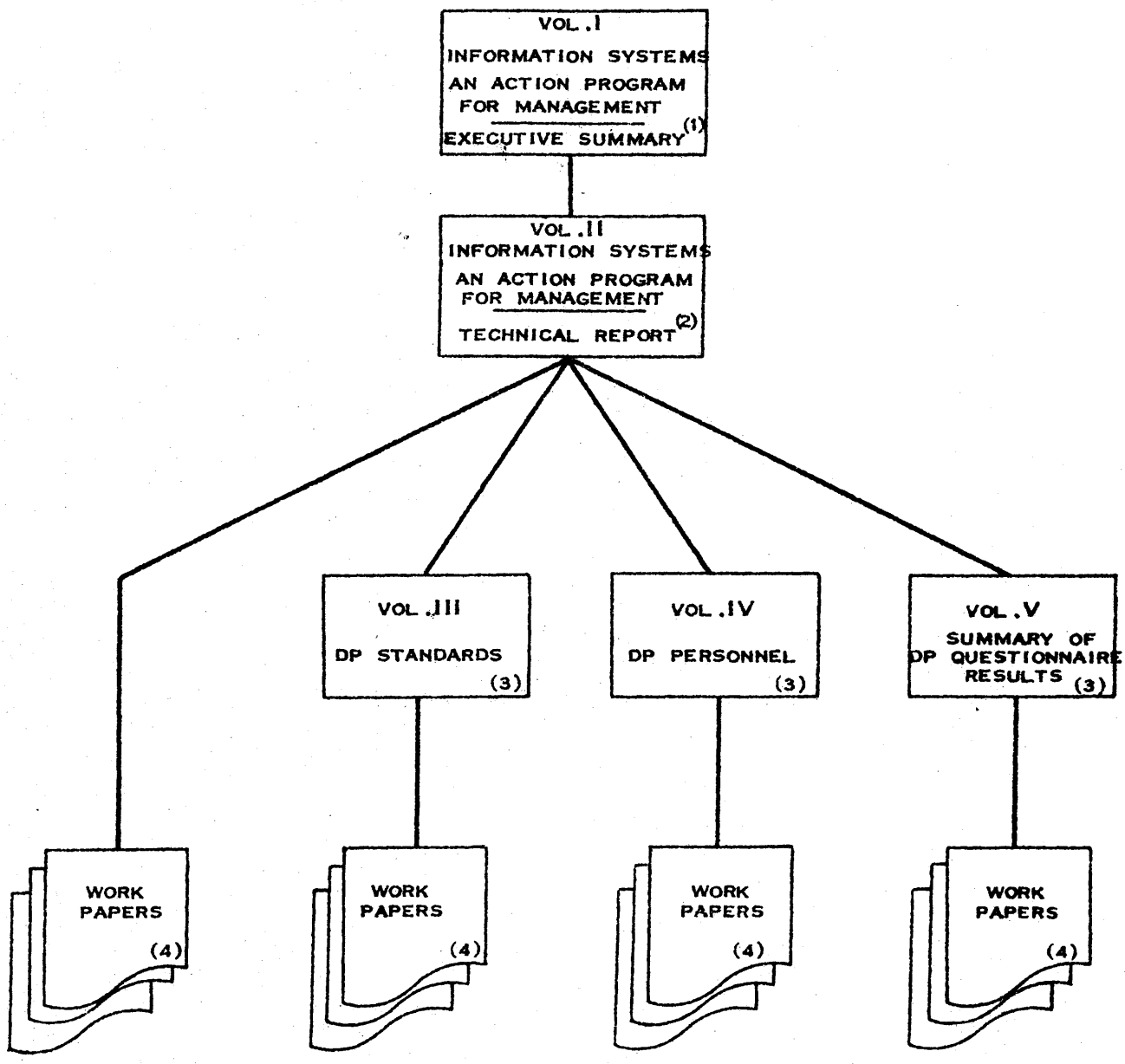
This volume is one of five which document the project. Its relationship to the other volumes is shown in Exhibit 1.

The scope of the project has been limited primarily to Mayoral agencies - generally those agencies for which the Mayor has appointive power for key personne

The City Council, the Comptroller, the Judicial Conference, the Borough Presidents, the Board of Education, the Board of Higher Education and numerous other independent boards, commissions, and authorities were not directly included in the scope of the study. Nonetheless, some of these agencies recognized the potential value of the study to them and volunteered information.

In the project, primary consideration has been given to short range problems (1 to 5 years) which have a long range impact. Very little detailed planning was done explicitly for long range.

PROJECT DOCUMENTATION



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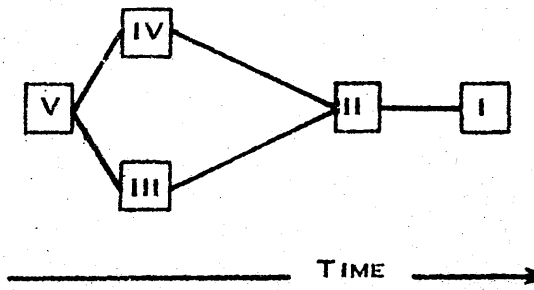

II. ENVIRONMENT, PROFILE AND DATA PROCESSING PROBLEMS

INTRODUCTION

Some basic understanding of the size and complexity of the City of New York and its government, of the DP studies preceding this one and of the current profile of DP in the City of New York is essential to understanding the recommendations in this plan.

Some sample statistics dramatize the scale and character of New York City's government:

- The population of the City is in excess of eight million people.

- The City's expense budget for 1969-70 will be 6.6 billion dollars - more than $300 million in excess of the budget requests of the States of California or New York for the same period.

- Although the population of the City is not growing dramatically, the demand for service is. Public Welfare is a case in point. More than one million people are receiving some form of public assistance in the City (one in eight).

- The City employs approximately 330,000 people. Only forty cities in the U.S.A. have a population (1960 census) greater than the number of people employed by the City of New York. The majority of the employees are covered by the Civil Service System and a constantly increasing number are being represented by unions.

- The City has a metropolitan government. Unlike all of the other huge American cities which have both county and city government serving the metropolitan area, the City of New York performs most functions which would be under county control in cities such as Philadelphia, Chicago, Detroit, and Los Angeles.

To more effectively manage its complex responsibilities, the City of New York is now undergoing a consolidation of a multitude of line departments "into ten line agencies, called administrations, upon whose principal executive officers would be imposed new responsibilities for planning, budgeting, administration and organization." [1] The City's boards, commissions, authorities, staff agencies, Fire, Police and Corrections Department were not affected by the reorganization.

The major concept which guided the Mayor's Task Force on Reorganization of New York City Government was the "creation of administrations which are congruent with the City's major problem areas and which possess ample legal authority to deal with those problems and their interrelationships". [1]

An unofficial functional organization chart of the City of New York as of March 1, 1969 is presented in Exhibit 2.

The reorganization of the City by the present administration offers a unique opportunity in municipal government to accomplish the objectives of this project for two reasons:

1. The process of reorganization has created an environment for accepting change which should faciliate much needed changes in data processing organizations.

2. The consolidation of agencies within public service program grouping significantly reduces the organizational barriers which would otherwise greatly inhibit developing information systems of broad enough scope to effectively support the City's major public service programs.

PREVIOUS MUNICIPAL DATA PROCESSING STUDIES IN THE CITY OF NEW YORK

Recommendations

A sequence of three related studies preceded this one. Their common purpose was to evaluate the City's data processing resources and to increase the effective and economical utilization of computer-based technology. The first study was a qualitative treatment of the problem. The second was directed to the quantification of the City's data processing profile in order to highlight the magnitude of the problem. The last report was intended to place the problem in perspective and to specify steps to bring about the needed improvements.

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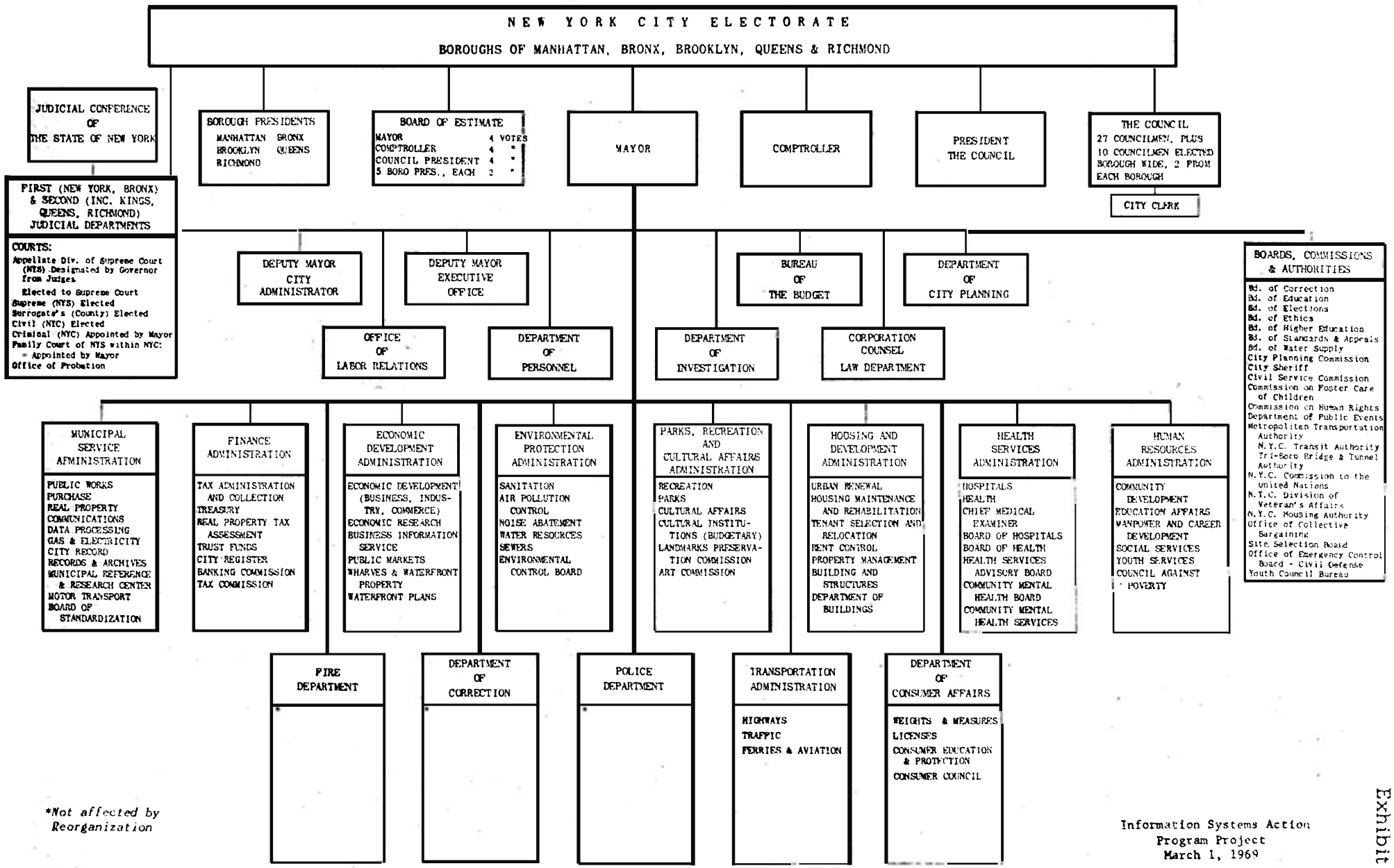
[1] The Mayor's Task Force on Reorganization of New York City Government - Report and Proposed Local Law, December 1966, Page 1.

THE ORGANIZATION OF THE CITY OF NEW YORK–Functional



*Not affected by Reorganization

Information Systems Action Program Project
March 1, 1969

Exhibit 2

A summary of the recommendations in the previous studies is presented below. In conjunction with the description of the current DP profile, reviewing the studies highlights the need for executing without further restudying the recommendations developed in this Action Program Project.

1. Temporary Commission Report on City Finances, 1966:

   a. Organization. The need to resolve the organizational location of the City's central DP unit was identified in this study. In effect, this issue was left unresolved.

   b. Selection Criteria. Relaxation of the City's cost displacement criterion for automation of applications was recommended.

   c. Equipment Management. The Commission recommended that the City formalize its specifications and requirements, taking account of the need for compatibility with procuring equipment. It suggested that equipment selection should be more competitive and that specifications should be framed in terms of equipment performance rather than specific machine characteristics peculiar to a particular vendor.

      Recommendations to improve utilization stated that departments should be charged the cost of the data processing services they received, and that better records on machine utilization should be kept.

      The general recommendation was made that the City's operating DP activities might well be organized into centers that serve a group of functionally related departments. No specific groupings of agencies were recommended.

   d. Technical Assistance. A continuing and increasing need for technical assistance in the following areas was highlighted: programming techniques, on-line real-time and communications systems, and the development of standards.

      A central programming staff was recommended to assist departmental programmers, particularly in using efficient new programming languages available with third-generation machines. The programming improvement effort would be a continuing activity within the City.

Concern about on-line real-time systems was expressed in the report. It stated that on-line real-time communications - based systems are expensive and should not be installed without thorough technical review of their costs and benefits in each instance.

To deal effectively with the technical issues involved, the commission suggested that a central DP unit should develop expertise in on-line real-time and communications based systems.

The commission recommended that a central unit develop a staff with data processing expertise and provide technical guidance to agencies through issuance of data processing standards. It stated that documentation of methods analysis and programming should be improved.

2. Office of Administration Review of EDP Systems 1967:

   a. Data Processing Equipment. An annual inventory of computing equipment and an analysis of costs was recommended.

   b. DP Equipment Cost. The observation was made that management needs to know more precisely what equipment is on hand, how much it is utilized, its costs to the City, and what return the City is getting for the time and money expended.

   A recommendation was made to carry the data processing function as a separate program or sub-program in the annual budget in order to ascertain readily the true costs incurred by each agency.

   c. Computer Utilization. Recommendations were made to develop a Citywide computer utilization log, and to establish criteria for management and control of computer operations.

3. Office of Administration Action Program for Information Systems, 1967:

   Need for a Plan. In the second report, the Deputy City Administrator emphasized that the nature of the activities of New York's municipal government made it essential that an over-all plan for information systems be developed and executed.

Implementation and Change Realized

The Temporary Commission's recommendations were not supported in enough detail to facilitate implementation by the reluctant bureaucracy. The New York City Information Systems Action Program Project resulted from the concepts advanced in the second of the two Office of Administration reports. The extent of success in implementing the suggestions made in the previous studies of the City's data processing remains to be seen. If the recommendations in this Action Program report are implemented, the Office of Administration and the Temporary Commission studies will have been productive.

CURRENT PROFILE OF DATA PROCESSING

Data Processing Survey Activity

One of the first activities of the Information Systems Action Program Project was to expand upon and update the inventory of the City's data processing resources and their use. A comprehensive presentation of the responses to the questionnaire which was used for the survey is presented in Volume V of the project, Summary of DP Questionnaire Results.

The DP Questionnaire, which is reproduced in Volume V, was designed to provide a comprehensive picture of data processing in the City. Although the questionnaire was designed to identify strengths as well as weaknesses, no effort was made to highlight either. Even though the Project Staff interviewed a number of agencies' DP personnel several times in order to secure or validate the data, primary reliance was on data supplied by agencies in the questionnaire. Admittedly, the data presented in Volume V and used for this report are not necessarily accurate in every case. However, they were useful to the Project Staff in defining relationships among agencies' DP personnel, equipment and applications and providing a foundation for planning purposes. The interpretations of the Project Staff presented below are based on data presented in Volume V and on observations made in the collection of data as well as during the execution of other project activities. Of necessity, the interpretations of the DP Questionnaire and of observations of the Project Staff were made on the basis of professional judgment developed from comparisons to industry and to other governmental units.

Accessibility of Data

One of the major findings of the survey was the unavailability of reliable fundamental information on the current status and future plans for data processing in the City agencies. In too many agencies, there simply was no one with sufficiently broad responsibility for data processing to enable the agency to respond appropriately to the basic

questions in the DP Questionnaire. In addition, some key agencies were reluctant to disclose information about their data processing efforts. Consequently, previously collected data and estimates based on known equipment and staffing were used to determine overall data processing costs.

Data Processing Expenditures

New York City is the largest government user of computers except for the federal government (which spends over $3 billion annually) and the State of California (which spends more than $40 million on 73 computers). Although it is difficult to compare City government to similarly large corporations, AT&T has more than 600 computers and the General Electric Company, which spends $120 million a year on data processing, has more than 365 computers. The City of New York spends about $21 million on 29 computers. (If the non-Mayoral agencies such as the Department of Higher Education and independent authorities are involved, the City spends about $29 million and has 89 computers.)

Data Processing expenditures for a three-year period for equipment, personnel, and other categories are shown by agency in Exhibit 3. The total costs are displayed graphically in Exhibit 4 in order to show their growth and the relationships of the categories to total data processing costs. In addition to the overall growth of data processing expenditures, the high projection of "contractual services" costs is noteworthy. In spite of a multi-million dollar investment in contractual services, the City has very limited capability to effectively define, manage and control the data processing services for which it contracts. As a result there sometimes is a dependence on consultants irrespective of the timeliness or quality of their work.

A large portion portion of the annual expenditures for data processing (about one-third) is funded from the City's capital budget. Twenty-two of the twenty-nine computers included in the survey are purchased. The policy of the City in purchasing computers has led to major economies in its computer equipment acquisition costs. However, in the opinion of the Project Staff, the relative ease of obtaining capital budget funds and purchasing computers led to long-term inefficiencies in some cases.

Data Processing Personnel

Typically personnel costs are about 150 to 170% of the annualized equipment costs. Personnel costs for 1969 are projected to be in excess of 230% of annual equipment costs, but we do not believe that the City is receiving commensurate value.

DP BUDGETS BY AGENCY
/000 OMITTED/

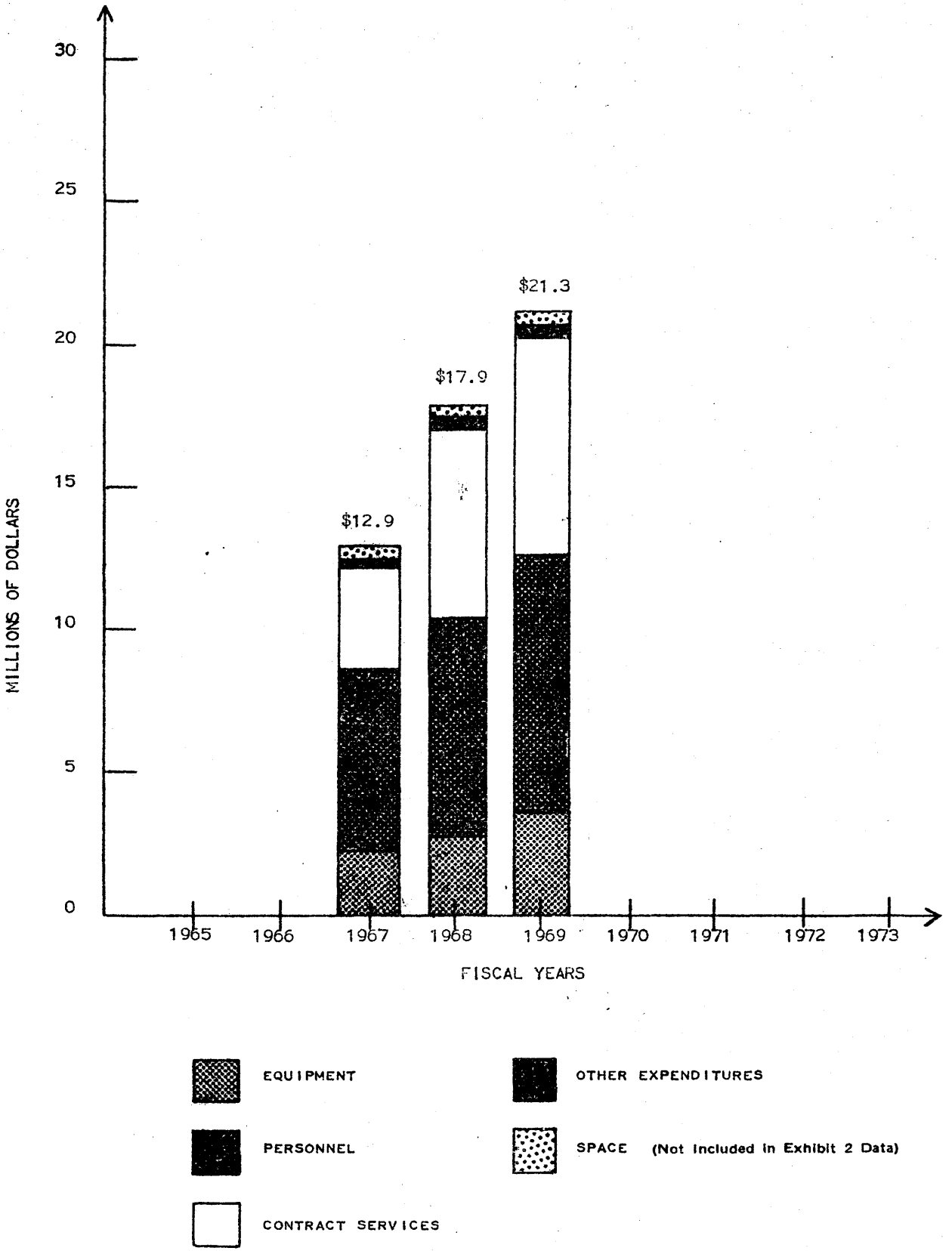
BUDGETS FOR FISCAL YEAR

ADMINISTRATION/ AGENCY	EQUIPMENT			PERSONNEL			OTHER*			TOTAL		
	1967	1968	1969	1967	1968	1969	1967	1968	1969	1967	1968	1969
CORRECTION	4M	4E	4E	12	12	12	1	1	1	17	17	17
ECONOMIC DEVELOPMENT												
MARINE & AVIATION	8	8	8E	27	29	31E	1	1	1E	36	38	40
CONSUMER AFFAIRS												
LICENSES	9	10	10	32	33	35E	1M	1E	1E	42	44	46
MARKETS	9	9	9E	21	27	29E	1	1	1E	31	37	39
ENVIRONMENTAL PROTECTION												
AIR POLLUTION CONTROL		2	6	51	121	264	40	70	85	91	193	355
SANITATION	9	9	15	37	146	195	2	6	10	48	161	220
FINANCE												
DEPT. OF FINANCE	263M	367E	445E	869M	1,172E	1,254E	2,068	3,364	3,144	3,200	4,903	4,843
REAL PROPERTY ASSESSMENT	10	10	10E	27	28	30E	6	3	3E	43	41	43
FIRE	27	43E	91E	159	178	187E	4	5	5E	190	226	283
MUNICIPAL SERVICES												
PUBLIC WORKS	14M	16E	25E	95	101	121	5	5	5	114	122	151
PURCHASE	70M	61	17E	170M	236E	294E	10M	11E	12E	250	308	323
REAL ESTATE	11	11	11	33	35	37	1	2	2E	45	48	50
HEALTH SERVICES			160E						500E			660
HOSPITALS	70M	74E	77E	177	256	264	10	24	13	257	354	354
HEALTH	47M	51E	59E	258	259	292	22	30	38E	327	340	389
HOUSING & DEVELOPMENT	77M	60E	26E	494M	527	564E	50M	51	58E	621	638	648
URBAN RENEWAL /CURMOO/	27	41	62E	63	72	101E	8	10	13E	98	123	176
HUMAN RESOURCES								100			100	
SOCIAL SERVICES	499	692	885	1,119	1,148	1,228	831	1,700	1,829	2,449	3,540	3,942
MANPOWER & CAREER DEV.								5	10E		5	10
YOUTH SERVICE AGENCY							22E	44	88E	22	44	88
POLICE	93M	337E	673E	713	856	1,059E	12	745E	1,115E	818	1,938	2,847
RECREATION												
TRANSPORTATION												
HIGHWAYS	11M	11	11	33M	37	39	1M	1	1	45	49	51
TRAFFIC	25M	25E	25E	22M	33E	35E	7	7E	7E	54	65	67
OTHER AGENCIES												
OFFICE OF ADMINISTRATION				113	118	150		40	65	113	158	215
BUREAU OF THE BUDGET	92E	133E	226E	96M	160	235E	12M	6	6E	200	299	467
PERSONNEL	30	39E	49E	128	146	156	19	19	20	177	204	225
OFFICE OF PROBATION	20M	23	26E	36M	79	85E	2M	4	4E	58	106	115
N.Y.C. CRIMINAL COURT	151	119	151	319M	359	438	369M	386	517	839	864	1,106
BOARD OF ELECTIONS	51	54	38	92	98	98	104	104	120	247	256	256
RETIREMENT & PENSIONS	17	17E	17E	71M	85E	91E	41	48E	55E	129	150	163
CITY ACTUARY	Not Applicable											
TEACHERS RETIREMENT BOARD	8	9	9E	37	37	40E	1M	1E	1E	46	47	50
NEW YORK COUNTY CLERK	13	13	13E	61	61	65E	9	9	9E	83	83	87
BROOKLYN PUBLIC LIBRARY			69E		39	43	4	4	13	4	43	125
NEW YORK PUBLIC LIBRARY	Not Available											
COMPTROLLER	602E	333E	464E	633M	743	1,022	119M	335E	310E	1,354	1,411	1,796
HOUSING AUTHORITY	72	105	96E	279	320	342E	14	33	33E	365	458	471
TOTALS	$2,339	$2,686	$3,787	$6,277	$7,551	$8,836	$3,797	$7,176	$8,095	$12,413	$17,413	$20,718

FOOTNOTES... M-MS400 REPORT
E-ESTIMATED

*-COST OF SPACE NOT INCLUDED

CITYWIDE DP COSTS



The high proportion of personnel costs to annualized equipment cost is of particular concern since the City has relatively limited data processing personnel capability and has had to rely mainly on equipment vendors and consultants for new data processing developments. Outside DP professionals have characterized a majority of the City's data processing personnel as being inexperienced in modern computer technology. With a few exceptions what technical quality does exist is spread very thin and, in the opinion of the Project Staff, top management does not appropriately support it.

The staffing structure of agencies and the City in general shows a poor mix of experienced systems and management skills relative to the operations and programming personnel. There is no general Civil Service title for systems analysts, consequently there is no hiring into that function. The title is needed. Many people perform the function but work out of title and much design work is contracted out. The high turnover of programmer trainees suggests that the City may be contributing more to data processing personnel needs of the business community than to those of the City government.

The DP Questionnaire responses highlighted that many man-hours are being expended giving and receiving training. In spite of the high cost associated with the training of DP personnel, a majority of the programs are not managed and agencies are dependent on vendors for training. No central City resources have been available to agencies for the development and management of DP training.

Computer Equipment

The location of computer equipment by agency and by geography is shown in Exhibits 5 and 6. They illustrate the close geographic proximity of computer installations in the City and suggest possibilities of consolidating and centralizing services. Los Angeles and Chicago are examples of cities which have consolidated their DP services.

The fact that thirteen of the twenty-nine computers are second generation indicates a high probability of continued acquisition of new medium size computers. A "creeping commitment" has already been observed since the start of the project.

Of the twenty-nine computers covered in the survey over 90% are from IBM. Nationally, it is estimated that IBM has approximately 65% of the market. The heavy use of IBM equipment may be a result of the influence on City agencies of the past Bureau of the Budget equipment policy which had emphasized computer equipment compatibility. This

Exhibit 5

GEOGRAPHIC DP PROFILE - LOWER MANHATTAN

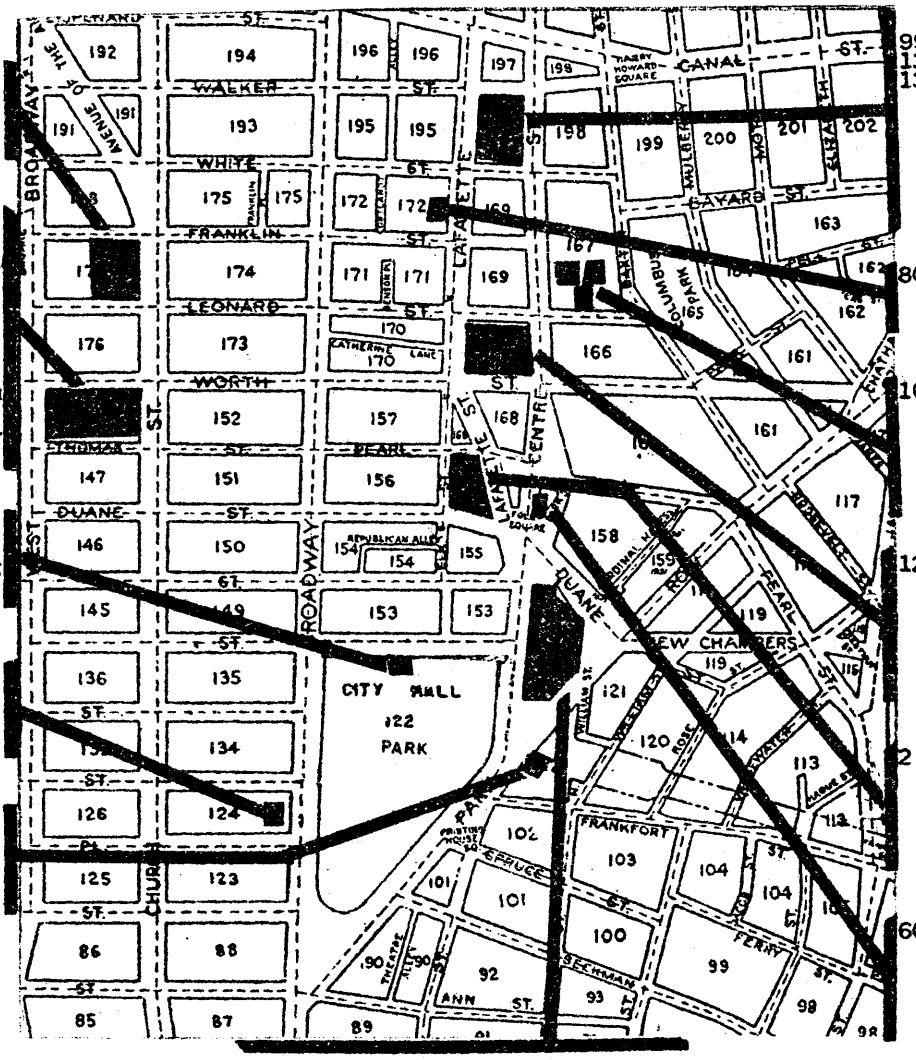
250 CHURCH STREET
- SOCIAL SERVICES EDP EAM

40 WORTH STREET
- PERSONNEL-EDP EA
- HIGHWAYS - EAM
- RETIREMENT & PENSIONS - EAM
- CITY ACTUARY-EAM
- TEACHERS RETIREMENT - EAM

CITY HALL
- EXECUTIVE OFFICE OF THE MAYOR - EAM

250 BROADWAY
- HOUSING AUTHORITY-EDP

38 PARK ROW
- RELOCATION & MG. SERVICES [CURMCO] -EDP



99 LAFAYETTE STREET
137 CENTRE STREET
139 CENTRE STREET
- FINANCE - EDP EAM
- MARKETS - EAM
- AIR POLLUTION-EDP

80 LAFAYETTE STREET
- LICENSES - EAM

100 CENTRE STREET
- CORRECTION - EAM
- NYC CRIMINAL COURT - EDP EAM

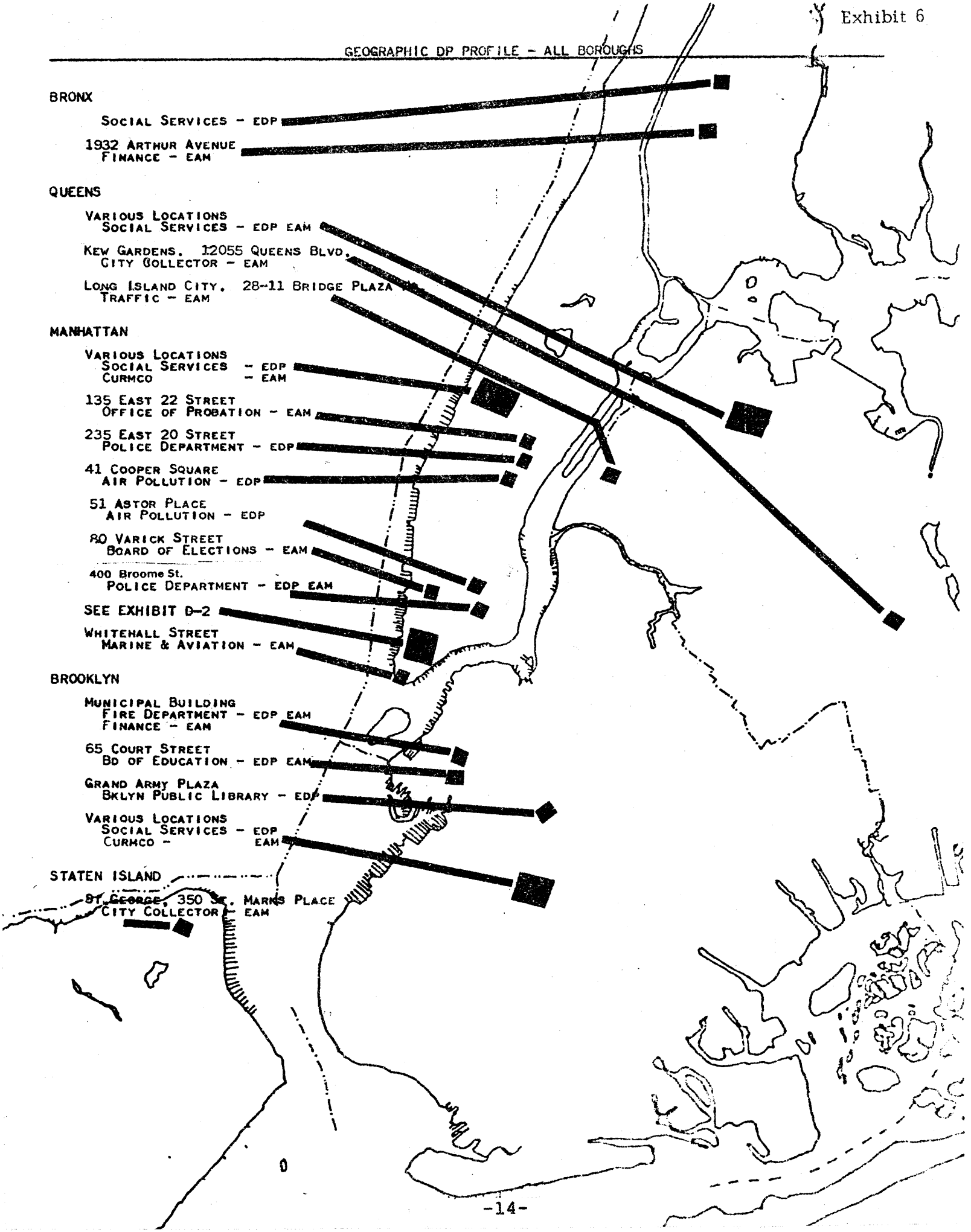
125 WORTH STREET
- SANITATION - EAM
- HEALTH - EDP EAM
- HOSPITALS - EDP EAM

2 LAFAYETTE STREET
- RENT & HOUS. MNTCE. EDP EAM
- REAL ESTATE - EAM

60 CENTRE STREET
- COUNTY CLERK NY COUNTY - EAM

MUNICIPAL BUILDING
- AIR POLLUTION CONTROL - EDP
- BUREAU OF THE BUDGET - EDP EAM
- COMPTROLLER - EDP EAM
- FINANCE - EAM
- PUBLIC WORKS - EDP EAM
- PURCHASE - EDP EAM
- REAL PROPERTY ASSESSMENT - EAM

GEOGRAPHIC DP PROFILE - ALL BOROUGHS



had minimized formal competitive bidding and led to complaints from other computer vendors. The policy may also reflect the City's vulnerable dependence on vendors who are able to provide major quantities of systems and software support; it should be noted that one of the anti-trust suits filed against IBM cites this point as possible evidence of restraint of trade.

Most of the City's third-generation computers were acquired for major new applications. Consequently, operation of second-generation computer programs in an emulation or compatibility mode on third-generation computers is satisfactorily below national averages. The City's third-generation equipment therefore has the potential to be operated more efficiently than would otherwise be the case, since operation in emulation or compatibility mode is considerably less efficient than operating in languages designed for third-generation equipment. The recent acquisition of an RCA Spectra 70/45 computer by the Human Resources Administration (HRA) points to a problem represented by the quantity of second generation equipment in the City. As the City's second generation equipment is replaced, the amount of emulation and resultant inefficiencies may also increase. In HRA, as a point in case, almost all of the applications on the Spectra 70/45 will be run in emulation mode for an indefinite period.

Even though all of the third generation equipment is capable of multi-programming, virtually none of the new systems which were designed for this equipment have taken advantage of multi-programming. As a result, effective utilization of the City's third-generation computers is well below its realizable potential.

Although there are five full shifts daily and more than forty shifts on weekends available on medium size third-generation equipment, no convenient mechanism exists to tap this capability. In some cases, the City has resorted to contracting with outside temporary employment agencies to hire the City's own employees to work in off hours on the City's computers, rather than dealing more directly with the problem of staffing extra shifts.

The probability of the City shortly outgrowing its small scale IBM 360/20 computers in the Fire Department and Personnel Department is very high. Yet, they are purchased machines and the applications on them are not compatible with large scale equipment. Consequently, switching to new large equipment will probably require expensive redesign and reprogramming.

DP Standards

Survey data on the programming languages used on the City's third-generation equipment indicate extensive reliance on machine-oriented languages (such as Assembly Language), and only limited use of COBOL (Common Business Oriented Language), a high level problem - oriented language. This indicates the heavy influence of one computer vendor as well as the lack of awareness by City DP management of cost trade-offs between machine efficiency and programmer efficiency; COBOL is easier to program,but it consumes more computer time.

Inadequate documentation standards have resulted in an inordinate amount of work to change programs when necessary. Consequently, most of the City's programming talent is assigned to problems of systems maintenance and is not available for programming new systems.

Space for DP Equipment and Personnel

The Project Staff concluded that space for DP systems and management personnel is cramped and below industry norms of spaciousness, lighting, furnishing and cleanliness. The City of New York's facilities are in marked contrast to the modern facilities recently installed by the City of Chicago for its newly centralized DP organization. The status of the City of New York's facilities seems to have a predictably detrimental influence on DP personnel recruiting, performance and retention.

Application Systems

The City has advanced beyond the conventional clerical and bookkeeping uses which characterized the early days of computers. It is starting to apply its computers directly to improve public services by using them for faster dispatching of police patrol cars, finding jobs for the unemployed, drilling students in arithmetic, protecting the public by speeding up the disposition of criminal cases in the courts, continuously monitoring air quality in order to spot potential pollution episodes early enough to take remedial action, and speeding the flow of traffic.

In spite of the significant accomplishments noted above, the overall view of the City's computer applications is less impressive. To begin with, meaningful summary of applications is inhibited by the lack of quality in applications design. A majority of the current City applications are designed to accomplish very limited jobs. Examples of applications developed within a broad system plan are few. In spite of its large DP expenditures, the City has many application areas which have not been automated and even more which have not been integrated into effective systems. The lack of a systematic approach to the development of applications continues to inhibit the establishment of effective practices for applications design within agencies and across agency lines. Patchwork is the design rule rather than the exception, and there are still cases where computer prepared reports are laboriously transcribed by hand into manual ledgers.

The applications identified for future development seem to reflect a continuation of the fragmented approach to the development of computer systems. An exception is a recognition of the potential of an integrated real property data system, the Geographic Information SysTem (GIST), a centrally coordinated real property system.

The recent selection of PL/1 as the programming language in the Health Services Administration highlights the need to adopt standard high level programming languages in the City in order to reduce dependence on a single equipment vendor. The City does not have a computer software systems analyst position and consequently cannot get staff personnel to evaluate the technical recommendations of vendors and consultants.

Programming language standards are but one element of data processing standards for which a need has existed and been recognized in the City for a long time. Nonetheless, as pointed out earlier, a comprehensive standards program of high priority and satisfactory quality did not exist at a central or agency level in the City prior to this project. Fragmented and consequently diluted efforts have been pursued from time to time with predictably limited results.

Very little formalized project management and control is utilized and regular presentation of plans and progress to top level management was reported in only 40% of the agencies.

SUMMARY OF THE PROBLEM

The present Administration inherited an obsolete DP structure which had not kept pace with the earlier technological changes. It is quite evident from the foregoing that some efforts have been made in the past to evaluate the City's ever-expanding data processing resources and to increase the effective and economical utilization of its computer technology. The City is undergoing a major shift to third-generation computer equipment and some technically sophisticated applications such as SPRINT (The Police Department's on-line real-time applications developed to reduce police response time to calls). Nonetheless, there is a continuing need for substantial improvement in the fundamental areas of data processing: DP personnel policies and practices; DP training; DP organization and staffing; DP standards; DP systems planning, development and control. In comparison to leading corporations and governments[1] which took steps along these lines in the period from 1963 and 1966, the City of New York has not kept pace with the significant technical advances of that period. Understandably, unlike its counterparts in industry, it has taken two to three years for the present administration to uncover and assay the full extent of this complex problem. Now, if the recommendations in this report are implemented, the City can move ahead to apply modern computer technology to the problem of governing New York City.

The remaining chapters in this report summarize the recommended Information Systems Action Program for the City of New York - a program designed to overcome the problems identified above.

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[1] California, New York, Colorado, Washington, Pennsylvania, Illinois Virginia, Vermont, Puerto Rico, Los Angeles, Chicago, Cincinnati, Miami Memphis and others have prepared such DP plans in the last five years.

III. ORGANIZATION OF CENTRAL DP FUNCTIONS

ALTERNATIVES

This section focuses upon the alternatives for organization of the three central data processing functions.

1. Information Systems Planning

2. Developing and Implementing Citywide Data Systems

3. Providing Central DP Processing Services

An extensive number of alternatives were given consideration; many were excluded. A summary of the remaining alternatives is presented in tabular form in Exhibit 7.

CRITERIA FOR EVALUATING THE ALTERNATIVES

The successful implementation of a technically and economically sound Information Systems Program requires people with the appropriate responsibility and authority in the organization who are committed to making the system work. The criteria used to evaluate the environmental feasibility of organization alternatives were consistency with the objectives of reorganization and ease of implementation.

Consistency with the Objectives of Reorganization

Because the City is undergoing major reorganization, the proposed data processing organization would have to be consistent with the objectives of the City reorganization in order to earn the commitment of the Mayor and his administration.

Ease of Implementation

If the Information Systems Program is to be an "action" program, then the DP organization recommended must also facilitate ease of implementation. In order of importance the key factors for ease of implementation are:

1. Authority to exercise control.

2. Commitment to implement a technically and economically sound Information Systems Plan.

3. Appropriate administrative structure.

4. Available managerial and technical capability.

TABULAR SUMMARY OF CENTRAL DATA PROCESSING ALTERNATIVES

ALTERNATIVES	CENTRAL DP FUNCTIONS		
	INFORMATION SYSTEMS PLANNING	CITYWIDE DATA SYSTEMS DEVELOPMENT	CENTRAL DATA PROCESSING SERVICE CENTER (1)
1	Bureau of the Budget	Bureau of the Budget	Bureau of the Budget
2	Office of Administration	Office of Administration	Municipal Services Administration
3	Bureau of the Budget	Bureau of the Budget	Bureau of the Budget - under separate Ass't. Director
4	Office of Administration	Office of Administration	Bureau of the Budget
5	Office of Administration	Bureau of the Budget	Municipal Services Administration
6	Office of Administration	Bureau of the Budget - Internal Data Systems Office of Administration External Data Systems	Municipal Services Administration
7	Office of Administration	Bureau of the Budget - Internal Data Systems Office of Administration - External Data Systems	Bureau of the Budget
8	Bureau of the Budget	Bureau of the Budget	Municipal Services Administration

(1) Under each of these organizations an option exists to contract with private industry for DP service center operation.

CONSULTANTS' ANALYSIS AND ORGANIZATION RECOMMENDATIONS

The Consultants believe that the most significant impediment to the City's effective use of computer based information technology is the lack of clearly defined central DP responsibility. The primary controversy over the organization alternatives is whether the Office of Administration or the Bureau of the Budget should be responsible for the Information Systems Planning function.

During the course of this project, there was close cooperation among the Consultants and a number of City agencies. However, the organization recommendations in this section are explicitly identified solely as those of the Consultants. This was done because no agreement could be reached between the Bureau of the Budget and the Office of Administration. The additional objectivity brought to the problem by the Consultants' independently developed, specific recommendations may be of value to the Mayor in the resolution of the very controversial organizational issues.

Organization Responsibility for Information Systems Program Planning

There are three clear alternatives for the Mayor:

1. Do nothing. That is, continue the present situation in which responsibilities are not clearly defined.

2. Assign the program responsibility to the Office of Administration with unambiguous authority to approve or disapprove requests for data processing resources, (personnel, equipment, contracts) consistent with approved plans. The staff of the Bureau of the Budget, from whom the major control of data processing resources will be taken, may not agree with the Office of Administration's data processing plans. Consequently, operation under this alternative could require, initially at least, the firm support of the Project Steering Committee and occasional intervention of the Mayor.

3. Reestablish the program in the Bureau of the Budget by putting the function at high enough level (Second Deputy) to achieve some balance with some of the staff who may oppose change. Transfer Dr. Savas, the present Deputy City Administrator, and the Management Science Unit staff to the new positions in the Bureau.

The first alternative is a poor choice because it deprives the City of effective technical leadership at a time when it is badly needed and destroys the momentum for change which has been developed. If the momentum is valuable, and the Consultants firmly believe it is, then the choice is between the other two alternatives.

The policy implication in the last alternative will be to reinforce the popular image that the Office of Administration is out of the mainstream of the City's administrative structure and does not have the power base to administer an important program. Stated more positively, the role of the Office of Administration would be limited to creating new programs and recommending changes in the present program. Its involvement would end when the program or project is at the stage at which another staff or line agency with appropriate responsibility is ready to operate the program.

Because of conflict implicit in the organization of the City's staff agencies, organization alternatives two and three presented above, are practical solutions that are an improvement on the present organization. A much better solution to the problem would be a reorganization of the City's staff agencies to eliminate the program redundancies, conflicts, and voids which are perpetuated by the current organization. Such a reorganization is beyond the scope of this project. Nonetheless, this project highlights the need to extend to the City's key staff agencies the reorganization concept that was used to consolidate line agencies. This would complete a major and far reaching government reform.

PLANNING GROUP

The Consultants strongly recommend that there should be a central information systems planning group. Of the major organization alternatives presented above, the project's Consultants recommend placing the information systems program planning responsibility in the Office of Administration. The recommendation is based primarily on the following opinion:

1. The staff and management of the Bureau of the Budget have not taken a positive position to implement the plan which is presented in this document.

2. Because of the scope of the budget function in the City of New York, successful development of data processing capabilities at the Administration level requires separating the data processing planning function and the budget function.

3. The Office of Administration is committed to implementing the plan in this document.

Policy Advisory Council:

Under either organization alternative it makes sense to preserve the coordination function which the Project Steering Committee (composed of policy level respresentation from the Executive Office, Office of Administration and the Bureau of the Budget) has effectively exercised. Such a body should be a permanent part of the formal organization. Although its informal authority is significant, its formal role should be advisory to the Mayor. The Council's effectiveness can be enhanced by establishing task forces from agencies involved.

Technical Advisory Panel:

The Technical Advisory Panel on Information Systems (TAPIS) provides an effective window to the data processing world outside the City government. This group should continue in its role as an advisor to the head of the organization which has information systems program planning responsibility.

Organization Responsibility for Citywide Data Systems

Internal Data Systems:

Internal Data Systems are interdepartmental data systems which are required for managing the City's dollar, personnel and physical resources. The central accounting system is the focal point for the various subsystems of the internal resource management data systems. As a result, the most comprehensive responsibility for interagency internal resource management systems is now in the Comptroller's Office.

However, the Comptroller is an independently elected official and may be of a different political party than the Mayor, as he is now. Consequently, assigning the central responsibility for this function to the Comptroller would weaken rather than strengthen the executive control of City government. Clearly this would be contrary to the objectives of the City reorganization.

The ability to exercise some influence over the Comptroller's role in the internal resource management systems is a major factor in the selection of organization responsibility for this function. This narrows the selection to one alternative, the Bureau of the Budget. It has maintained a satisfactory working relationship with the Comptroller's Office. Therefore, the Consultants recommend that the Bureau of the Budget have organization responsibility for developing Citywide Internal Data Systems.

Because Personnel, Finance, Bureau of the Budget, Comptroller and Municipal Services Administration have already computerized many subsystems, the major responsibility of the central function should be one of

planning and controlling the coordinated development of the subsystems. The actual development of the subsystems should be accomplished by task forces from the respective agencies supplemented by Central Data Processing Service Center personnel and, where appropriate, consultants.

The operational responsibility for the subsystems is primarily a technical consideration. Except for the Personnel Department and the Municipal Services Administration, computer operations capacity in the major agencies involved in the internal resource data system appear sufficient to provide for operation of the systems envisioned.

The proposed Municipal Services Administration Central Data Processing Service Center should be able to support the internal resource data systems operational requirements of Municipal Service Administration as well as those of the Personnel Department.

External Data Systems:

External data systems are interdepartmental data systems for conducting transactions between City government and the public. The Consultants recommend that the planning and control of external data systems should be located in the Office of Administration. The major reasons for this are:

1. Planning and development should be disassociated from operating responsibilities of an agency to assure attention to interagency requirements.

2. Expertise exists in the agency as a result of the development of the preliminary stages of a real property data system.

Task forces supplemented by consultants and/or Central DP Service Center personnel under External Data Systems central staff direction should do the planning and development.

Actual operation and maintenance of the data systems should be the primary responsibility of the Central DP Service Center.

Organization Responsibility for Central Data Processing Service Center

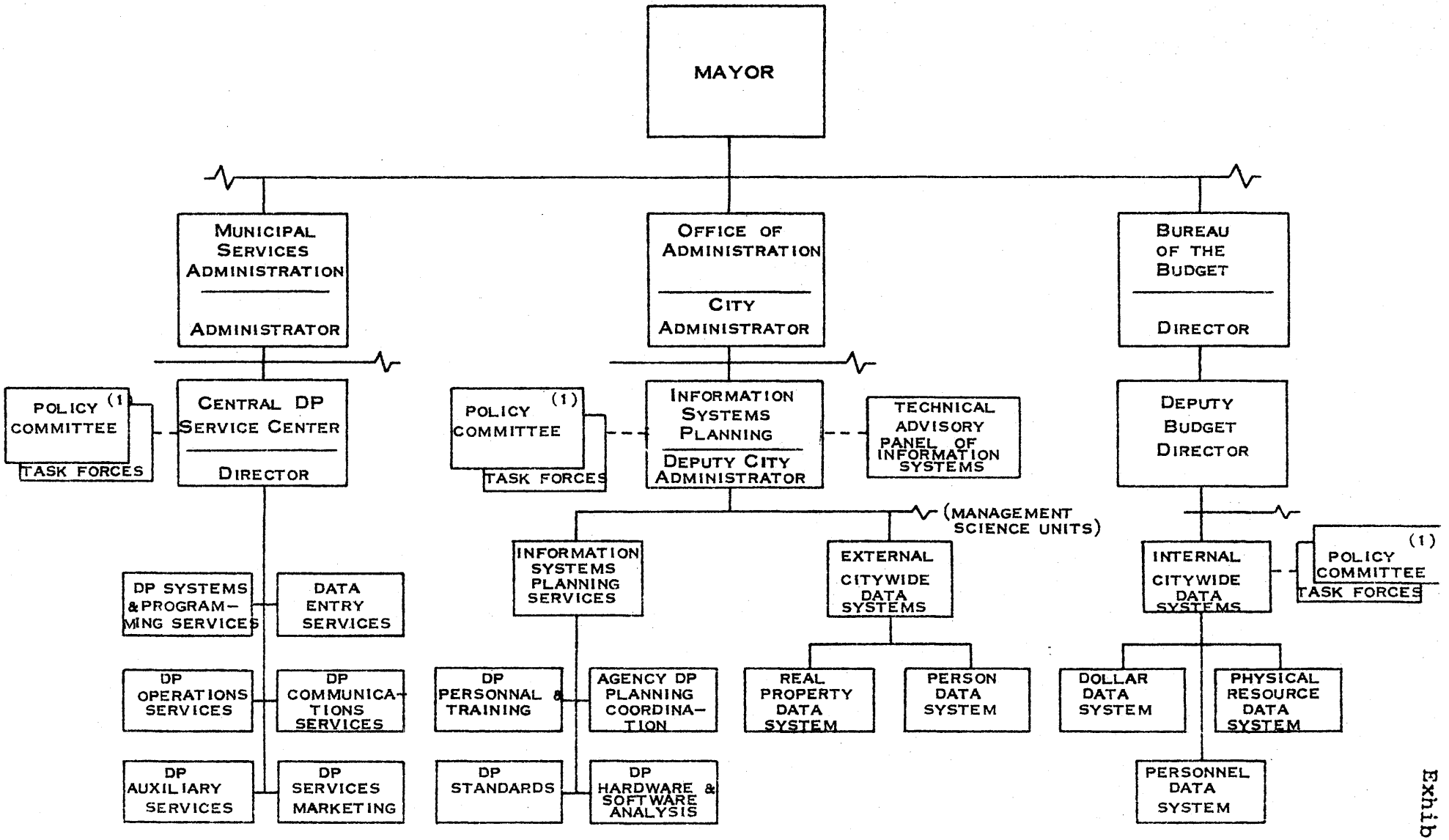
The Central DP Service Center should be in the Municipal Services Administration since the Center's service role is highly compatible with the Administration's program. To do otherwise would be directly contrary to the legislation (requested by the Mayor) establishing the Municipal Services Administration. In addition, emphasis on the development of good quality will set a badly needed example for other City agencies. Similar organizations for central data processing services have been found successful in large states such as New York and California and in the cities of Los Angeles and Chicago.

This recommendation conforms with current Municipal Services Administration legislation and executive orders. It does not prohibit the use by the Municipal Services Administration of alternatives external to the City as a way to assure the quality central DP services needed by the City.

Summary of Recommended Central DP Organization

The relationship of the central DP organizations recommended by the Consultants is presented in Exhibit 8.

CENTRAL DATA PROCESSING ORGANIZATION RECOMMENDED BY THE CONSULTANTS



(1) THESE ARE ALL THE SAME COMMITTEE BUT TASK FORCES VARY BY ORGANIZATION.

Exhibit 8

IV. CENTRAL DP FUNCTIONS - INFORMATION SYSTEMS PLANNING

OBJECTIVE AND FUNCTIONS

One of the City's management goals should be to take full advantage of modern information handling technology to support, effectively and efficiently, municipal programs whose ultimate purpose is to serve the public. The purpose of the Information Systems Planning group is to provide one central and authoritative organization in the City government from which to direct the pursuit of this goal.

The group should be responsible for the satisfactory performance of six major functions:

1. To develop and maintain a comprehensive DP plan.

2. To monitor and, as appropriate, control implementation of the DP plan.

3. To provide DP technical staff support to all City agencies.

4. To guide City agencies on policy matters which involve computer technology.

5. To represent the City of New York on matters involving data processing.

6. To serve as a central source of information on City DP activities.

Develop and Maintain a Comprehensive DP Plan

The group should prepare a comprehensive plan for the use of computer technology by the City. The DP plan would be approved by the Mayor and disseminated to all City agencies affected by it. Prior to submission of the DP plan to the Mayor for approval, it should be presented to the Information Systems Policy Advisory Council for review and recommendations. The City DP plan should be constructed from plans which agencies would be required to submit to the group. The reports from this project constitute a recommended first such plan.

Monitor and, as Appropriate, Control Implementation of the DP Plan

The Information Systems Planning group should have responsibility to review and evaluate each agency for the following:

1. Effectiveness of installed computer applications and equipment in meeting agency and City needs.

2. Efficient use of DP resources.

3. Progress of DP projects against plans and schedules.

Based on those reviews and evaluations, it should advise agencies on appropriate courses of action and, where possible, provide or help locate needed DP technical or management resources.

The group should be the final DP technical authority for the evaluation of DP resource requests. As such it should provide DP technical staff support to the City staff agencies including the Mayor's Executive Office, the Bureau of the Budget, the Office of Administration, the Personnel Department, City Planning, the Department of Purchase in the Municipal Service Administration, and the Board of Estimate.

Approval or disapproval of requests for DP resources should be based on:

1. Conformity to City DP Standards.

2. Technical capability of the resources to economically meet the performance requirements specified by the requesting agency.

3. Compatibility of the request with the City DP plan.

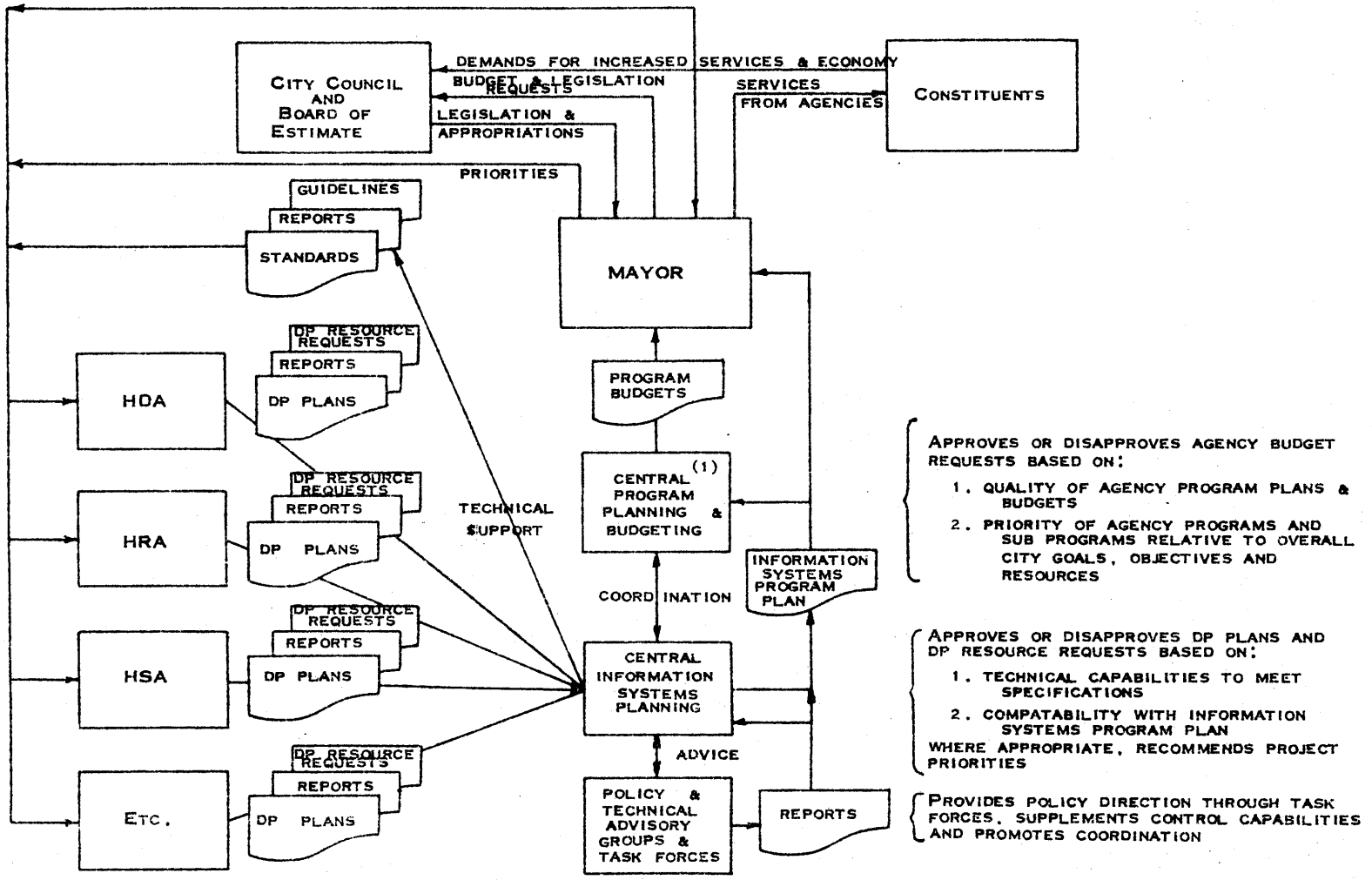
The above authority does not pre-empt the authority of City Planning or the Bureau of the Budget to implement executive policy in the budgetary process through the discretionary allocation of the City's limited capital and expense funds. The group should not determine what the goals and objectives of agencies should be or how much money should be allocated to the programs managed by the individual agencies. These are problems for those concerned with program planning and program budgeting. The relationship of DP planning to PPBS is illustrated in Exhibit 9.

Provide DP Technical Staff Support to All City Agencies

By providing those DP staff services which can best be offered centrally, the group would be viewed as a source of objective professional assistance rather than as an additional obstacle to be cleared before the agency can get on with its real work.

DATA PROCESSING PLANNING & PROGRAM PLANNING AND BUDGETING RELATIONSHIP

IN THE INFORMATION SYSTEMS PROGRAM PROCESS



(1) PPBS FUNCTIONS NOT SHOWN

Exhibit 9

The group should:

1. Directly assist agency administrators, commissioners, and directors in:

   a. Establishing or modifying a DP organization.

   b. Developing new concepts of DP resource utilization in support of agency programs.

   c. Formulating DP plans and their presentation.

   d. Evaluating proposed technical solutions prepared by equipment vendors, outside consulting firms, or individual agencies' staffs.

2. Maintain technical specialists available to consult with agency technical management on problems such as selection and maintenance of computer hardware and software systems.

3. Provide interagency DP coordination and leadership in the development of all aspects of the DP standards including systems design, programming, operations and management. Define mandatory DP standards.

4. Coordinate data transmission activities with agencies and the Central DP Service Center by:

   a. Establishing shared lines wherever possible in order to reduce the total data communications cost to the City.

   b. Providing technical consultation to City agencies in the design and operation of data communication systems.

   c. Developing methods of cost distribution for data transmission on the intracity telephone network, shared lines, interagency computer-to-computer communication, and any future data communications switching centers.

   d. Developing standard message identifiers and formats for use on shared data networks.

   e. Standardizing data transmission codes.

5. Identify and promulgate appropriate policies, guidelines and procedures for a coordinated Citywide information systems program.

6. Administer a DP Development Fund.

7. Assist agencies in locating and acquiring state, Federal, and foundation monies for computer projects.

The kind of staff services described for the Information Systems Program Planning group are not to be confused with those provided on a fee basis by the Central DP Service Center. The latter will generally be for intensive participation in the design, implementation and operating stages of specific data processing projects.

In addition to providing DP consultant services, using the DP Development Fund effectively is another way that the group can emphasize its positive role in the City's DP activities. The DP Development Fund could be used to:

1. Initially acquire DP resources needed to satisfy unexpected demands of the DP Service Center.

2. Provide contingent DP funds to agencies which have met milestone requirements.

3. Purchase proprietary software packages for future use in several agencies; and

4. Purchase services for information systems planning activities that will benefit a number of agencies.

The funds appropriated to the Department of Purchase for computer purchases should be appropriated instead to the Information Systems Planning group for use as part of the DP Development Fund. The coordination of funds from outside sources for DP projects could be accomplished in a manner similar to, and in conjunction with, the proposed DP Development Fund.

Guide Agencies on Policy Matters Involving Computer Technology

Quite apart from the technical use to which computers may be put by the staff agencies of the City, each staff agency is likely to get involved in policy matters within its jurisdiction which involve computer

technology. The Information Systems Planning group should be available to provide guidance and expertise on such matters.

Represent the City on Matters Involving Data Processing

Extensive intergovernmental efforts are under way to establish standard definitions of data elements and programming languages in order to facilitate data interchange. The City can anticipate increased regional activities with respect to transportation, water pollution and air pollution, for example. The City of New York has a great deal at stake on these issues, and should participate aggressively and responsibly on intergovernmental and professional task forces which address them. The Information Systems Planning group is a logical choice to represent the City or to delegate others to do so on such DP task forces.

Serve as a Central Source of Information on City DP Activities

The Information Systems Planning group will maintain a current inventory, by agency, of DP equipment, personnel, space, and applications. This material will be helpful in formulating agency plans for DP and measuring accomplishment against the plans. Publishing such statistical information on deployment and utilization of DP resources in newsletters and in an annual DP plan can be a valuable service to agencies which, for management purposes, want to compare themselves to other agencies.

The City now does exchange a variety of information on its DP activities with other government units, trade and professional organizations, educational institutions, consultants and vendors. The benefits from such exchanges to the City justify assignment of the general responsibility to the Information Systems Planning group.

This will strengthen the City's link to the DP professional community and improve trade press coverage of its DP accomplishments. This should pay off in recruiting, for example, and in attaching more competition to bid for the City's DP business.

RESPONSIBILITY, STAFFING AND FINANCING

The staffing of the Information Planning group should include a Deputy City Administrator, two section managers and professional staff and clerical assistance. The proposed functional organization chart for the group is presented in Exhibit 10. Projects coordinated by the group will be staffed and financed by the participating agencies with staffing supplemented as necessary by personnel from the Central DP Service Center.

INFORMATION SYSTEMS PLANNING
PROPOSED ORGANIZATION

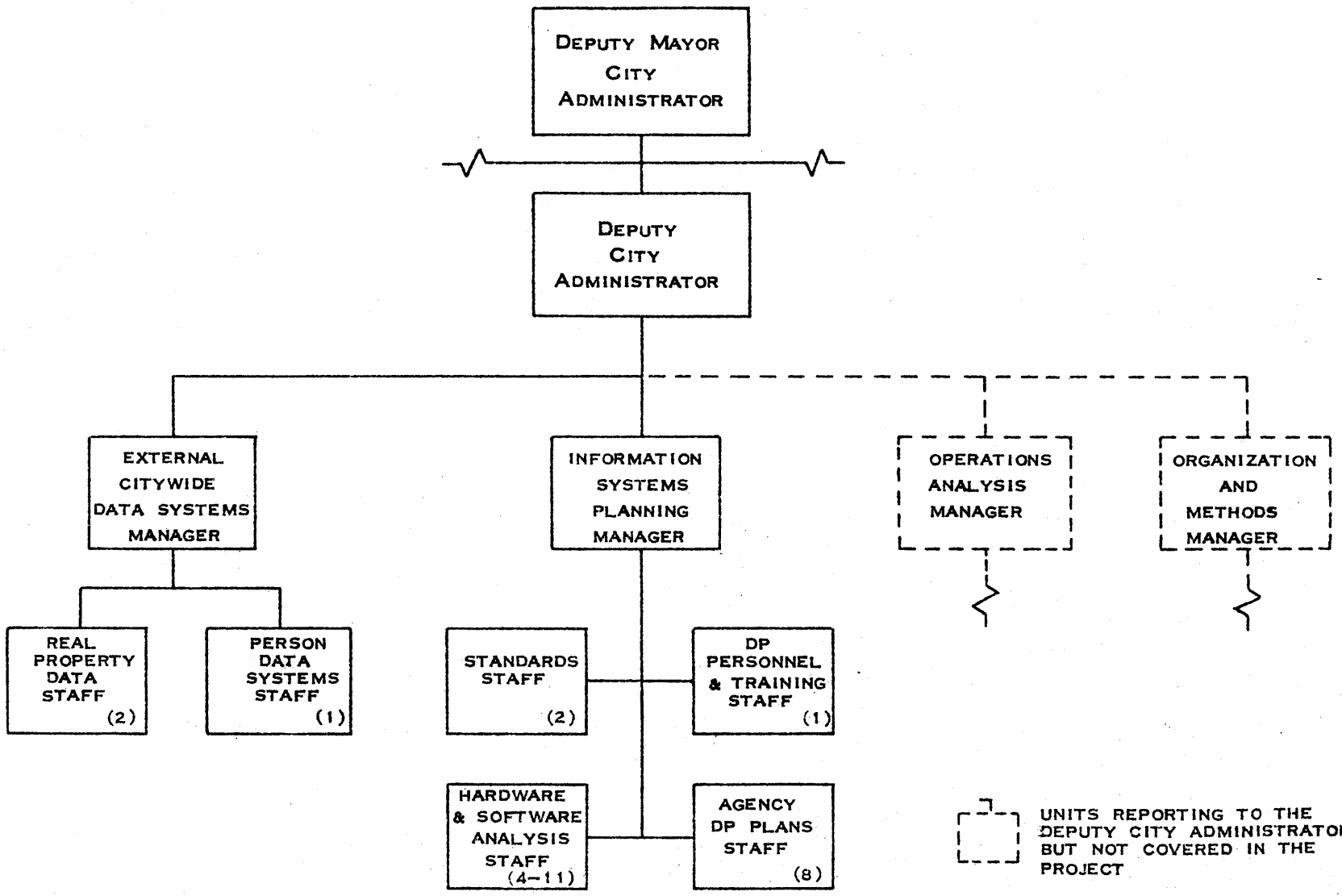


Exhibit 10

The group should be financed within the budget of the Office of Administration. The appropriation should include a specified sum for a DP development fund, discussed above, to be used at the discretion of the Deputy City Administrator with the approval of the New York Information Systems Policy Advisory Council.

Just as the cost of certain personnel in the Bureau of the Budget and the Departments of City Planning and Public Works is included within the capital budget because of their work on capital budget items, an analogous arrangement should be considered to support the Information Systems Planning group.

V. CENTRAL DP FUNCTIONS - CITYWIDE DATA SYSTEMS

CLASSES OF CITYWIDE DATA SYSTEMS:

Citywide data systems relate to both the internal management programs of City government and the public service programs of City agencies. The two classes of Citywide data systems, outlined in Exhibit 11, are:

1. Internal Resource Management Data Systems

2. External Data Systems

INTERNAL RESOURCE MANAGEMENT DATA SYSTEMS:

Municipal government manages three kinds of internal resources: dollars, personnel, and physical resources. If the executive management of these resources is to be effective and efficient, the resource data systems should be relatively common to all agencies. The Citywide data systems for internal resource management are:

1. The Dollar Data System:

   a. to maintain the City's central records of account and appropriate detailed status records of appropriations, encumbrances, expenditures, and revenues for the various City funds.

   b. to facilitate the initial preparation, necessary revision, final preparation, and subsequent modification of the budget.

2. The Personnel Data System: to provide a central City position and employees' master file for the benefit of the Department of Personnel, the employees' retirement systems, the Bureau of the Budget, as well as all other Administrations and agencies. The Personnel System includes the necessary subsystem to provide computerized data for the centralized processing of payroll warrants by the Comptroller.

3. The Physical Resource Data System: to provide appropriate inventory procurement and management records and the necessary subsystems for centralized preparation of vendors' warrants. It also includes City property and space inventory and the preparation of reports for space management and planning purposes.

MAJOR CITYWIDE DATA SYSTEMS

Internal Resource Management Data Systems

Dollar Data System
- revenue
- accounting
- budget

Personnel Data System
- classification
- employee history
- skills inventory
- retirement management
- position control
- testing
- payroll

Physical Resource Data System

- supply and equipment
- City property and space inventory and control

External Data Systems

Real Property Data System

People Data System

The internal resource management data system should be developed to gather data, store them, and make them available in a useful form regarding dollars, personnel, and physical resources, their availability and utilization, as well as the historical cost and budgetary information concerning them.

Opportunities for Economies

The City has achieved economies through the use of data processing in its agencies. For example, because of its dominant control of a major portion of the internal resource management systems - namely accounting and payroll - the Comptroller's office has prevented the proliferation of computerized payroll systems among other City agencies. Such proliferation has been experienced by some other large governmental jurisdictions. However, the interagency supply and use of internal resource management data are extensive and provide opportunities for improved administrative service and economies by:

1. Reducing the fragmentation of intra-agency application systems caused by job-oriented systems design.

2. Standardizing computer prepared data and providing for data exchange between agencies.

3. Providing central assistance to line agencies to develop data-compatible subsystems.

There appears to be a major need to coordinate interagency systems in Internal Resource Management Data Systems. The potential for proliferation of personnel data systems development exists in Administrations and an opportunity for direct cost reduction in the present costs of providing such information is apparent. Therefore, a high priority should be placed on the coordinated development of citywide personnel data systems. The fact that approximately sixty to sixty-five percent of the City's expense budget is for personnel expenditures and that approximately 330,000 employees are involved are compelling reasons to develop an integrated computer based personnel data system. The personnel data system cannot help but improve the management of that vital and costly resource.

The staff of the Internal Data Systems group should consist of a small number of highly qualified personnel who can effectively direct the implementation of internal data systems by task forces consisting of DP personnel and management from the agencies involved in the systems. The operation of developed systems is dependent upon the specified requirements of the systems. Major consideration should be given to operation in the Central DP Service Center, rather than expanding significantly existing DP installations.

The Internal Data System group might consist of an Assistant Budget Director, two section managers (Computer Systems Managers), and appropriate professional and clerical staff.

The group should be financed within the budget of the Bureau of the Budget.

EXTERNAL DATA SYSTEMS

The External Data Systems are those which have data characteristics of high usage and common need among a large number of Administrations, none of which has such a dominant need for the data that it alone can justify the development and operation of the system. Data commonality is a logical consequence of the fact that all major City services to the public can be related to persons (including corporate persons) and real property.

Real Property Data Systems

Development is well underway and should be continued on a computerized information system for the land and buildings in New York City. This information is now contained in separate records of approximately twenty municipal agencies concerned with various aspects of real property. The new computer-accessible files will allow all City agencies to exchange data now maintained in uncoordinated, cumbersome and obsolete filing systems.

This advanced unified system is the previously mentioned GIST (Geographic Information SysTem). It is now being developed under the leadership of the Office of Administration with the Department of City Planning, Finance Administration, and Housing and Development Administration.

With 830,000 different real estate properties in the City, each involved in transactions with various City departments, only modern high-speed computers and sophisticated methods can bring together, summarize and extract meaningful information from the reams of related data that are gathered. It will take an estimated three to six years to develop the full system in its entirety. However, its development is evolutionary and many of the components will be in use in the near future. In particular, three vitally needed capabilities of GIST are expected to be operating in 1969:

1. GIST will generate maps automatically by computer.

2. GIST will permit merger of information from different departments by matching addresses despite wide variations in formats, spacing, spelling and abbreviations.

3. GIST will bring together information about properties on a block regardless of whether it is filed by address, by tax-block number, or by census-block number.

People Data Systems

A broad range of data about individuals in the City of New York is collected,processed, stored and maintained on a variety of events, literally from birth to death. In spite of a recognized need for agencies to know facts available from other agencies about people they service, the City does not have a common system for identifying people in its automated records.

As a first step in evaluating the practicality of a people data system, the City should develop a standard way to identify people so that the computerized data about the same people in different files can be correctly and unambiguously linked to that one person.

After the above has been accomplished, then quantitative design information could be obtained easily on the commonality of person data among agencies, as well as the frequency of common usage. Statistical sampling and related techniques could be used to develop these measures. Such an analysis would be fundamental to the evaluation of the economic and social considerations which must be resolved before any major program is undertaken to develop a comprehensive people data system for the City of New York. Clearly, political feasibility will depend upon the degree to which privacy can be protected.

External Data Systems responsibilities, staffing and financing was discussed as part of Information Systems Planning.

BENEFITS FROM CITYWIDE DATA SYSTEMS

The benefits of Citywide Data Systems will be derived from seven major factors:

1. Avoiding the costs of expensive, redundant work on systems design and implementation which would result if agencies continue developing uncoordinated, fragmented, independent systems.

2. Achieving economies through more efficient utilization of computer processing and through shared, centralized computer processing.

3. Achieving economies by reducing the amount of clerical time spent on preparing input data for the computer.

4. Improving the efficiency of City management through more timely information on budgeting, personnel, purchasing and accounting problems.

5. Improving the effectiveness of City programs by being more responsive to the public. This can result from the use of external data systems which focus on the real property or person affected by the City services rather than upon the variety of agencies providing the services.

6. Improving procurement practices by making the City a more responsive customer to its vendors.

7. Improving the relationship of the City with its nearly half million employees and retired employees through a Personnel Data System which efficiently maintains appointment, eligibility, and promotion lists and accumulates earnings and service information relevant to retirement benefits.

In addition, the importance of Citywide Data Systems will grow exponentially with the expanded implementation of local agency offices. The effectiveness of delivering services while "going local " will depend increasingly on the availability of data that Citywide Data Systems should be able to provide.

VI. CENTRAL DP FUNCTIONS - CENTRAL DATA PROCESSING SERVICE CENTER

INTRODUCTION

The purpose of the Central Data Processing Service Center should be to provide a source of data processing resources to all agencies which need them and cannot get them more efficiently and effectively from alternative sources. This statement reflects a number of characteristics which are essential to a successful central data processing service function in New York City:

1. If justified, other alternatives should be available to potential user agencies (use of their own DP resources, use of other agencies' excess DP resources or use of purchased DP services from private industry).

2. The services offered by the Center should be charged to users to facilitate comparison to other sources of DP services and to provide a measure of operating efficiency.

3. After the initial capital investment, responsiveness of the DP Service Center should be motivated by a need to generate funds for continual operation and expansion. It must operate efficiently, and by effectively providing needed DP services, generate a demand for its services in order to survive.

SERVICE REQUIREMENTS

There are four basic service requirements which the Central DP Service would be expected to satisfy:

1. Assist smaller agencies which lack the requisite personnel and equipment to take advantage of data processing technology.

2. Realize the benefits of economy of scale in data processing through some centralization of data processing resources.

3. Process work from other agencies' data processing centers or Administration data processing service centers when they become overloaded due to short or intermediate term surges in processing or systems development demand.

4. Supply emergency services to compensate for other agencies' computer equipment failure or losses of key data processing personnel.

At a minimum level of service, computer processing should be provided. Third generation computing equipment would be utilized, operating three shifts per day, five to seven days per week.

The next highest levels of service would include the following:

1. Systems analysis services.

2. Programming services.

3. Data entry (key punching cards, keystroking to magnetic tape/disk) and associated EAM services.

4. Auxiliary services (printing, bursting, collating, microfilming, EAM operations, tape and disk cleaning and maintenance, etc.)

5. Central brokerage of City agencies' excess computer processing time.

6. Centralized computer time-sharing service for engineering and analytical personnel throughout the City.

7. Central computer data and message switching (in the future).

CURRENT CENTRAL DATA PROCESSING SERVICES

Although the Office of Administration has been active as a broker of computer time in a growing number of cases, the Bureau of the Budget is now providing the only significant computer equipment and time brokerage services in the city.

While the present DP service function is provided as a mechanism to stem proliferation of data processing installations, the level of service offered to agencies is limited and does not provide an assurance of timeliness and quality of performance essential to the satisfaction of present and potential users of central DP services.

CANDIDATE AGENCIES

Six agencies which use EDP facilities and eight agencies which have EAM equipment are being considered as the major user

group of the initial Central DP Service Center. The agencies are:

Candidates Using EDP	Candidates with EAM
Public Works	Real Estate
Purchase	Ports and Terminals
Sanitation	Highways
Air Resources	Traffic
Office of Administration	Consumer Affairs
City Planning	Executive Office
	County Clerk
	Board of Elections

The current profile of the fourteen candidate agencies is shown in Exhibit 12.

In addition, the following agencies may require some data processing resources from the Central DP Service Center: Water Resources, Law Department, City Sheriff, Motor Transport Service, Department of Gas and Electricity, Department of Investigation, Human Resources Administration, Housing and Development Administration, the Courts, Labor Relations, Corrections, City Clerk's Office, and the Board of Water Supply.

SPECIFICATIONS FOR THE INITIAL DP SERVICE CENTER

Consolidating the DP needs of the fourteen candidate agencies alone is enough to justify a Central DP Service Center on strictly economic grounds. However, the initial DP service center should be capable of expanding to meet additional demands.

Operations

Based upon current machine utilization, estimated effects of systems changes and projected resource demands, our best estimate of equipment required in the initial configuration is a medium sized computer system roughly equivalent to an IBM 360/40 with a minimum 128,000 characters of main storage. We can also project that there will be one communications system with backup and an EAM system. No change is assumed in data entry costs even though there may be operating economies resulting from centralization of keystroke personnel.

The computer configuration proposed for the initial Central DP Service Center will quickly reach capacity as the DP Center wins the confidence of potential users. Flexibility to meet initial demands and postponement of additional computer capacity acquisition can be

INITIAL DP SERVICE CENTER

CURRENT PROFILE OF FOURTEEN CANDIDATE AGENCIES

($000's; FISCAL YEAR 1969 COSTS)

EDP CANDIDATES		
Number of Agencies		6
Equipment Costs	$ 78	
Personnel Costs	950	$ 1,028
Less: Data Entry Costs -		
Equipment	$ 14	
Personnel	165	179
TOTAL COSTS		$ 849
Number of Operations Personnel	38	
Less: Number of Data Entry Personnel	22	16
Number of Systems Development Personnel		24
Number of Management Personnel		4
TOTAL NUMBER OF PERSONNEL		44
EAM CANDIDATES		
Number of Agencies		8
Equipment Costs	$ 130	$
Personnel Costs	381	511
Less: Data Entry Costs -		
Equipment	$ 14	
Personnel	172	$ 188
TOTAL COSTS		$ 323
Number of Operations Personnel	52	
Less: Number of Data Entry Personnel	23	29
		0
Number of Systems Development Personnel		0
Number of Management Personnel		0
TOTAL NUMBER OF PERSONNEL		29
GRAND TOTALS		
Number of Agencies		14
Number of Personnel		73
Equipment Costs		$ 178
Personnel Costs		$ 994
TOTAL		$ 1,172

NOTE: ALL PERSONNEL COSTS INCLUDE 22½% FRINGE BENEFITS

achieved through the management of unutilized time on other agencies' third generation computer equipment. Unused computer capacity should be made available to the Central DP Service Center to staff and manage as feasible.

Remote Batch Processing:

Computers that operate in a multiprogramming mode, as those of the DP Service Center should, generally can have the capability to accept input from a remote location, store the input, process it, store the output, and transmit the output back to the remote location. This capability, called remote batch processing (or remote job entry), is a logical one for the DP Service Center. Either low speed or high speed terminal devices can be used. In many applications, the high speed terminal may be a self-contained small computer.

The remote batch mode of operation offers several advantages to the City. Its major asset is user security and control of data. File handling is not really a problem if tape or disk drives are attached to the small computer at the remote location. Remote batch processing will also allow a small agency to run sophisticated programs through direct access to a large central processing unit. Because the technique is relatively new, the full economic implications are not yet known, but it could be cheaper than operating a small computer.

Communications:

As more agencies develop communications oriented systems and become sophisticated in the use of communications capability, the DP Service Center may well develop into a central message switching center. However, except for remote batch processing, the interagency communications role of the DP Service Center will be small, in the short-range.

Message switching by computer can be envisioned for the Departments of Sanitation, Police, Fire, Hospitals and Social Services. This will become particularly important as the concept of neighborhood centers and decentralized local city offices continues to be implemented.

Systems Development

Currently the candidate agencies have twenty-four systems development personnel. Since the requirements for redesigning the potential user agency application will result in an increased systems development staff, it appears logical to assume that a large systems staff will be required. However, while the number of systems analysts will increase from none to between eight and twelve, the number of

programmers will probably remain about the same. The level of programming skill will have to be upgraded by programmers with third generation knowledge.

Cost Summary

Using the costs developed from planning models, the total annual estimated savings over current costs is between $190,000 and $502,000, which is more than enough to pay for the one-time cost of systems changes required. The projected costs for the initial service center are estimated to be $670,000 to $980,000. The major benefits from cost reduction result from a significant reduction in the number of operations personnel. The EAM and second generation equipment proposed for replacement by the Central DP Service Center have low rates of utilization and in comparison to a third generation computer require a disproportionate amount of manpower to operate.

Responsibility, Staffing and Financing

The Director of the Central Data Processing Service Center should be administratively responsible to the Administrator of the Municipal Services Administration. In addition, the Central DP Service Center should receive policy direction from the New York Information Systems Policy Advisory Council and special task forces of users.

Responsibility for services to users should be clearly identified in a written DP service agreement.

The staffing of the Central DP Service Center should consist of the Director and manager or supervisory personnel and appropriate technical and clerical staff for the sections providing the following DP services: systems and programming, operations, auxiliary services, data entry services, communications services, and marketing.

The Central DP Service Center should be dependent upon operating revenues for its survival. In that way, a service responsiveness can be truly maintained. It should operate with a working capital fund. All operating costs should be charged at standard rates with all reimbursements and other receipts credited as revenue of the fund.

The initial costs associated with starting up the Central DP Service Center should be financed out of the budget of the Municipal Services Administration. This will facilitate the rapid development of a service level capability essential to continued operation. The standard rates developed should generate funds which will be available for expanding the resources of the Central DP Service Center somewhat in anticipation of need. Unless such a funding philosophy is utilized, the Center service capability will be continually behind demand and its effectiveness in stemming unnecessary proliferation of computer centers will be severely limited.

VII. NON-CENTRAL DP FUNCTIONS-STRATEGIC DEPLOYMENT AND ORGANIZATION OF DP RESOURCES

INTRODUCTION

The development of a plan for deployment of non-central DP resources is severely limited by the lack of significant:

1. Directly comparable developments in other government organizations.

2. DP planning by individual City agencies.

Nonetheless, the development of a strategy for the deployment of non-central DP resources is essential to the achievement of the City's information technology goals. In order to develop and evaluate alternative strategies, two major approaches were used:

1. Use of a simplified model as a major measure of the economic feasibility.

2. Use of information systems design concepts as a major measure of technical feasibility.

The modeling technique provided for evaluation of centralization and decentralization alternatives for satisfying agency requirements projected approximately five years in the future. The results of the forecasts were then used in concert with information design concept considerations as the basis for recommending a strategy to follow for deploying DP resources to agencies.

COST EFFECTIVENESS ANALYSIS OF ALTERNATIVE RESOURCE DEPLOYMENT

The comparison of DP resource deployment strategies shows a slight but not a major economic benefit from centralization. The analysis summarized in Exhibit 13 dramatizes the increase projected in DP expenditures for equipment acquisition and DP personnel employment as well as related space needs. In the next five years, total DP expenditures can be expected to almost double. Expenditures for equipment will be a less significant proportion of the growth than other factors. DP space and DP personnel costs can be expected to triple. The larger growth projected for DP personnel employment relative to overall projected growth in expenditures is accounted for by projected:

SUMMARY OF PROJECTED[1] GROWTH IN DP EXPENDITURES AND EMPLOYMENT

	Data Processing Expenditures ($ 000's)		
	Projected Expenditures	Increase over 1969 Dollars	Percent
1969 Estimate	$21,200		
Projection - Decentralization	$29,400 - $41,900	$8,200 - $20,700	39-98%
Projection - Centralization	$27,400 - $39,600	$6,200 - $18,400	29-87
Difference[2]	$5,000 - $2,300	$2,000 - $2,400	10-11
	DP Personnel Employment (000's)		
	Number of DP Personnel	Increase over 1969 Number	Percent
1969 Estimate	1,190		
Projection - Decentralization	2,330 - 3,240	1,140 - 2,050	96-172%
Projection - Centralization	2,220 - 3,190	1,030 - 2,000	87-168
Difference[2]	110 - 50	110 - 40	9- 4

[1] Approximately five years

[2] Decentralization minus centralization

1. Greater use of multiple shift staffing of DP equipment.

2. Reduced expenditures for purchased services.

3. Staffing new classifications which will provide the City needed computer systems analysis capability.

The most significant finding from the analysis is the lower projection of DP management personnel needs which results from centralization. The tight labor market for qualified personnel makes the lower need of such personnel a major advantage of the centralization alternative.

CONSIDERATIONS IN INFORMATION SYSTEMS DESIGN

In addition to the economic consequences (the costs) of a centralization or decentralization strategy, DP systems design concepts should have a major influence on the City's policy. To a major degree, the concepts employed will determine the operational benefits from the resource deployment policy.

Computer-Based Information Systems Design Concepts

Historically, there have been four concepts associated with the evolutionary development of computer-based information systems. They are:

1. Duplication of the individual operations which were carried out in the prior method of accomplishing work. An example would be a payroll system which, on a routine basis, creates a hard copy payroll ledger for each employee. In such a system, third generation computer equipment is often used to run pre-first generation applications. This is an apparent misuse of the computer's potential.

2. Job-orientation of solutions to information systems problems. An example is a payroll system which does an efficient job of preparing a payroll but does not provide any computer compatible data for the budget, accounting, personnel or retirement system.

3. Integration of major applications into groupings which are logically related to the primary service functions of the organizations involved. In municipal government, computer applications within a public service program would be such a grouping. In health services, an example might be a computerized patient care system which provides the accounting data necessary for patient and second party billing as a by-product of facilities scheduling, medication control, meal planning, and related patient care systems.

4. Consolidation of a logical array of fundamental units of data called data elements into a special or multipurpose data base system. These data bank systems are typically conceived as a way to reduce or eliminate redundancy in the collection, storage, maintenance and retrieval of data. An example is a personal data bank system which contains in computerized storage a broad range of relevant data on City residents who have dealings with several different agencies.

With very few exceptions, the City of New York has limited its computer-based information systems design concepts to the first two categories: duplication and job-orientation.

Although there is a need to change from present policies and practices, the answer to the City's under-achievement in data processing applications design is not a great leap forward into the exotic world of general purpose data banks. A vast majority of those in the recent past who have tried such a great leap misjudged the distance between concept and the state of the art. As a result, many have experienced setbacks in their data processing programs. The state of the art is such that this approach, with specific exceptions discussed previously, is not technically or economically feasible for the City of New York. While computer equipment on the market may be able to accomplish the job at high cost, the technical skills to design, develop and implement general purpose data banks are not available in the quantity and at the price that the City could afford.

Recommended Design Strategy

Integration of major applications into groupings which are logically related to the primary service functions of the organizations involved, is the design strategy recommended for the City of New York.

The Administrations provide a logical organizational level for integration of applications into broad systems. It is only at that organizational level that the systems' architects can have the perspective necessary to eliminate the inefficiencies characteristic of present job-oriented information systems.

The impact of Federal-state programs on local government reinforces the logic of grouping applications at the local level based on public service program responsibilities.

The recommendation for integrating major applications into public service program based information systems can be accomplished through a series of evolutionary and incremental steps. The approach is schematically presented in Exhibit 14. In the approach, all major applications are studied as a system in the "Systems Planning and Feasibility" step. Based on the results of that step, projects are dropped, postponed, partially or fully implemented as priorities indicate.

The key difference between this integrated systems oriented approach and the job-oriented approach is that in the systems oriented approach the relationship between the individual application and the system is known. Consequently, the major areas in common between applications can be clearly defined. This eliminates many of the applications or omissions which occur when an application is developed from the more narrow perspective of job orientation.

Although the theoretical general purpose data bank has no immediate place in the City of New York Information Systems Program, the data bank concept in a more narrow definition does. Data banks which are designed to gather and provide information for well defined purposes can and should be developed. Special purpose data systems are discussed in the chapter on Citywide Data Systems.

RECOMMENDED DP RESOURCE DEPLOYMENT STRATEGY

Systems Development Staff Deployment

The recommended computer systems design cannot be realized effectively unless the systems development staff is placed at the organization level where policy is determined and where the broadest system viewpoint prevails. Consequently, the systems development staff should report to the Deputy or Assistant Administrator. An examination of current DP reporting relationships helps explain the existence of fragmented design in the City's previously developed computer applications. Only in the Correction, Consumer Affairs, Health Services and Finance Administrations, the Comptroller, and in the Fire Department does the DP organization report directly to a deputy. In the remaining nineteen agencies surveyed, there are from three to five levels of reporting. This clearly indicates a need

BASIC APPROACH TO FUNCTION RELATED COMPUTER INFORMATION SYSTEMS DESIGN

ACTIVITY	APPLICATION PROJECTS			
	A(5)	B(2)	C(3)	D()4
SYSTEMS PLANNING AND FEASIBILITY(1)	X	X	X	X
PROGRAM ANALYSIS AND NEW SYSTEMS REQUIREMENTS		X	X	
SYSTEM DESIGN AND PROGRAM SPECIFICATION		X	X	
PROGRAMMING AND PROCEDURAL DEVELOPMENT		X		
SYSTEM TESTING, CONVERSION AND IMPLEMENTATION		X		
SYSTEM OPERATION		X		
SYSTEM REVIEW AND EVALUATION		X		

(1) COMPREHENSIVE EFFORT CHARACTERIZED BY HEAVY MANAGEMENT INVOLVEMENT AND INCLUDING ALL MAJOR RELATED FUNCTIONS

(2) PROJECT DEFINED AS HIGHEST PRIORITY IS CARRIED TO COMPLETION

(3) BECAUSE OF A HIGH PRIORITY AND INTERDEPENDENCE WITH THE HIGH PRIORITY APPLICATION, THIS PROJECT PROCEEDS SIMULTANEOUSLY TO THE SYSTEM DESIGN AND PROGRAM SPECIFICATION ACTIVITY.

(4) THIS APPLICATION IS FOUND TO BE INFEASIBLE AND NO FURTHER WORK IS DONE ON IT.

(5) THIS APPLICATION IS OF LOW PRIORITY AND IS SCHEDULED FOR A FUTURE DATE.

for restructuring to decrease the number of reporting levels and to place the systems groups where they can be most effective.

In very large and well developed Administrations, it is possible that major justification may exist for a systems development staff at lower levels. The scarcity of qualified DP management and technical personnel is such that the Administration staff should be well developed before decentralized staffing is permitted. Priority should be placed on staffing for the broadest need first. After that, decentralized staff at lower levels in the Administration may be justified if the decentralized unit:

1. Can economically justify an appropriate scale of operation.

2. Complies with systems requirements defined by the Administration staff.

The City is too large and complex for a central data processing planning group in a staff office of the Mayor to independently set priorities for Administrations' data processing programs. The City has tried this approach too long and has failed. In addition, such an approach is incompatible with the concepts of City reorganization. Under those concepts, the Administrators are assumed to have the capability and authority to set their own priorities within the resource constraints of their program budgets. Therefore, highest priority should be placed on helping the Administrations to organize and staff appropriately to carry out their DP responsibilities. The central DP planning group in the Mayor's staff agency can be more effective if, rather than continuously second guessing agency personnel, they have a basis for confidence in the technical competence of the Administration staff.

Intra-Administration task forces should be used to coordinate Administration DP activities and to bring the proper mix of skills to bear on DP problems.

DP Operations Deployment

The number and location of computer installations per se is not important. The use of the DP resource deployment strategy model showed that the economics of the alternative strategies were not significantly different. In fact, as computer technology advances in the next few years, the use of time sharing and more effective remote input/output stations will make the location of the computer central processing unit even less relevant.

However, there are some constraints on computer deployment which tend to favor the strategy of centralization:

1. The central processing unit must be technically capable of supporting the recommended systems design concept. For many Administrations, the minimum scale computer to do this would be the medium size computer operations. Full utilization of the equipment would favor centralization.

2. In most Administrations, more than one department would share a computer installation. An independence of operation necessary to such a service role requires that the center manager report to higher or neutral authority. The consequence of this requirement is centralization under the agency Administrator, his Deputy, or his Assistant.

In general, the non-central DP service centers should operate in a manner similar to that recommended for the Central DP Service Center.

Policy Recommendation

Based on the above discussion, we recommend that the City adopt the centralization strategy as its basic policy for the deployment of the City's DP resources.

Under the policy, Finance, Housing and Development, Health Services and Human Resources Administrations as well as the Police Department, should be responsible for establishing (if they do not already exist) systems development and operations functions at the Administration level. At the Administration's discretion, the DP functions may be combined or separate units but should report to the Deputy or Assistant Administrator.

The fact that some Administrations are not fully operative and others have installations on a decentralized basis should temper the timing of policy implementation but not its achievement.

Small systems development groups, not including programmers, are recommended for Fire, Environmental Protection, Transportation and City Planning. These agencies appear to have significant DP project potential which will require continued close work of a systems group in the agency. Supplementary systems development services, including all programming and operations support would come from the proposed Central DP Service Center.

A major amount of work is anticipated on a large number of operating programs in the Department of Social Services which are poorly documented. Even though centralization of Human Resources Data Processing is recommended, a systems maintenance group will probably be required for a transitionary period.

A large and continuing DP program is anticipated for the Personnel Department. Consequently, it should have a small systems development group even though a major portion of its support should come from the Central DP Service Center and the Internal Data Systems group.

The summary of Administrations and other agencies recommended to have an Administration/Agency DP service center, or to use the Central DP Service Center, is presented in Exhibit 15. This applies to administrative computer systems and does not show those computer operations which involve on-line traffic control, dispatching, monitoring or processes control.

A comparison of the projected centralization and 1969 DP expenditures is presented in Exhibit 16. In the projections, data used for projection of expenditures was based on the basic computer configuration for the model used and arithmetic average expenditure for the staffing model used. This was done to simplify the presentation of data. The overall projected expenditures could be as much as 20% higher than those presented in Exhibit 16.

Exhibit 15

SUMMARY OF
RECOMMENDED DP RESOURCE DEPLOYMENT STRATEGY

ADMINISTRATION / AGENCY	ADMIN. AGENCY DP SERVICE CENTER		CENTRAL DP SERVICE CENTER		REMARKS
	SYSTEMS DEVELOPMENT	DP OPERATIONS *	SYSTEMS DEVELOPMENT	DP OPERATIONS *	
FINANCE	X	X			
FIRE	X		X	X	POSSIBLE COORDINATED DISPATCHING WITH POLICE SMALL SYSTEMS GROUPS (NO PROGRAMMERS)
ECONOMIC DEVELOPMENT			X	X	
CORRECTION			X	X	TO BECOME EVENTUAL USER OF JUDICIAL CONFERENCE DP SERVICE CENTER
ENVIRONMENTAL PROTECTION	X		X	X	SMALL SYSTEMS GROUP NO PROGRAMMING IN ADMINISTRATION
POLICE	X	X			
PARKS, RECREATION AND CULTURAL AFFAIRS			X	X	
TRANSPORTATION	X		X	X	SMALL SYSTEMS GROUP NO PROGRAMMING IN ADMINISTRATION
HOUSING AND DEVELOPMENT	X	X			
CONSUMER AFFAIRS			X	X	
HEALTH SERVICES	X	X			POSSIBLE OPERATION OF DP SERVICE CENTER BY THE PROPOSED HEALTH SERVICES CORP.
HUMAN RESOURCES:	X	X			DEPT. OF SOCIAL SERVICES DP PERSONNEL PRIMARILY SYSTEMS MAINTENANCE
(DEPT. OF SOCIAL SERVICES)	X				
STAFF AGENCIES: CITY PLANNING	X		X	X	SMALL SYSTEMS GROUP, NO PROGRAMMING IN ADMINISTRATION
COMPTROLLER	X	X			
MUNICIPAL SERVICE	X		X	X	RECOMMENDED CENTRAL DP SERVICE CENTER
OFFICE OF ADMINISTRATION	X		X	X	RECOMMENDED INFO. SYS. PLAN & EXT. DATA SYS.
PERSONNEL	X		X	X	SMALL SYSTEMS DEVELOPMENT STAFF IN PERSONNEL
BUREAU OF BUDGET	X	X			RECOMMENDED INTERNAL DATA SYSTEMS
ALL OTHER STAFF AGENCIES			X	X	
JUDICIAL CONFERENCE	X	X			1ST AND 2ND JUDICIAL DEPARTMENTS

* ON-LINE PROCESS CONTROL COMPUTER OPERATIONS ARE EXCLUDED.

COMPARISON OF 1969 and PROJECTED[1] CENTRALIZATION DP EXPENDITURES[2]

ADMINISTRATION	@ 1969 ESTIMATE					PROJECTED CENTRALIZATION					DIFFERENCE[3]				
	EQUIP.	PERS	OTHER	SPACE	TOTAL	EQUIP.	PERS	OTHER	SPACE	TOTAL	EQUIP.	PERS	OTHER	SPACE	TOTAL
MUNICIPAL SERVICES	$ 53	$ 452	$ 19	$ 7	$ 531	$1,095	$3,540	$ 227	$ 242	$ 5,104	$1,042	$ 3,088	$ 208	$ 235	$ 4,573
FINANCE	455	1,284	3,147	71	4,957	745	1,630	156	135	2,666	290	346	(2,991)	64	(2,291)
FIRE	91	187	5	5	288	23	30	4	5	62	(68)	(157)	(1)	-	(226)
ECONOMIC DEVELOPMENT	8	31	1	5	45	23	30	4	5	62	15	(1)	3	-	17
CORRECTION	4	12	1	2	19	35	95	7	14	151	31	83	6	12	132
ENVIRONMENTAL PROTECTION	21	459	95	11	586	23	30	4	5	62	2	(429)	91	(6)	(524)
POLICE	673	1,059	1,115	32	2,879	805	1,205	170	71	2,251	132	146	(945)	39	(628)
PARKS, RECREATION & CULTURAL AFFAIRS	-	-	-	-	-	29	95	8	14	146	29	95	8	14	146
TRANSPORTATION	36	74	8	8	126	35	95	7	14	151	(1)	21	(1)	6	25
HOUSING & DEVELOPMENT	88	665	71	7	831	745	1,630	156	135	2,666	657	965	85	128	1,835
CONSUMER AFFAIRS	19	64	2	9	94	35	95	7	14	151	16	31	5	5	57
HEALTH SERVICES	296	556	551	22	1,425	1,536	3,855	316	342	6,049	1,240	3,299	(235)	320	4,624
HUMAN RESOURCES	885	1,228	1,927	173	4,213	1,492	3,360	302	274	5,428	607	2,132	(1,625)	101	1,215
COMPTROLLER	464	1,022	310	50	1,846	658	900	143	86	1,787	194	(122)	(167)	36	(59)
OTHER AGENCIES	543	1,305	326	84	2,258	704	1,240	84	89	2,117	161	(65)	(242)	5	(141)
JUDICIAL CONFERENCE	151	438	517	20	1,126	728	2,265	176	186	3,355	577	1,827	(341)	166	2,229
TOTAL	$3,767	$8,836	$8,095	$ 506	$21,224	$8,711	$20,095	$1,771	$1,631	$32,208	$4,924	$11,259	($6,324)	$1,125	$10,984

(1) Projections are approximately five years in the future

(2) Basic configuration and staffing averages used

(3) Projected Centralization – 1969 Estimate

( ) = Negative Number

Exhibit 16

VIII. DATA PROCESSING PERSONNEL PROGRAM

INTRODUCTION

Successful implementation of the New York City Information Systems Action Program is dependent upon adequate staffing in all managerial, technical and support areas. The advent of third generation computers and the rapid development of DP technology have emphasized the need for a flexible position structure capable of satisfying the job requirements of both central data processing activities and Administration/agency data processing activities.

The City's present DP classification structure and training programs are designed for the craft shop environment of small second generation computers and tabulating equipment. The major thrust of the recommendations made here is to provide personnel classifications and career paths which reflect the new requirements associated with technological advances in this rapidly advancing field. Care has been taken to design a personnel plan which will effectively meet the needs of both new and old types of systems, since both will continue to exist in the City for some time.

POSITION STRUCTURE

The present position classification structure and its accompanying salary levels are shown in Exhibit 17. The Action Program Project identified a total of 1,192 people performing DP functions. In spite of the number of personnel with data processing responsibilities, citywide titles for DP operations management and for computer system analysis are, except for a few special cases, nonexistent. These functions, and programming and operations functions as well, are being performed by individuals with a wide variety of non-DP titles.

No data processing activity can achieve its objective without adequate staffing. Eleven percent of all the authorized DP positions are unfilled. When the programming and operations areas are examined, the proportion of vacancies is even greater. One quarter or more of the senior level jobs are not filled. This suggests that the City's present salary ranges and career opportunities cannot attract and hold needed staff in the vital upper levels of these critical functions.

Career paths in the present Civil Service structure are "straight up", that is, eligibility for competitive promotion examinations for senior positions is limited to incumbents in the junior level position immediately

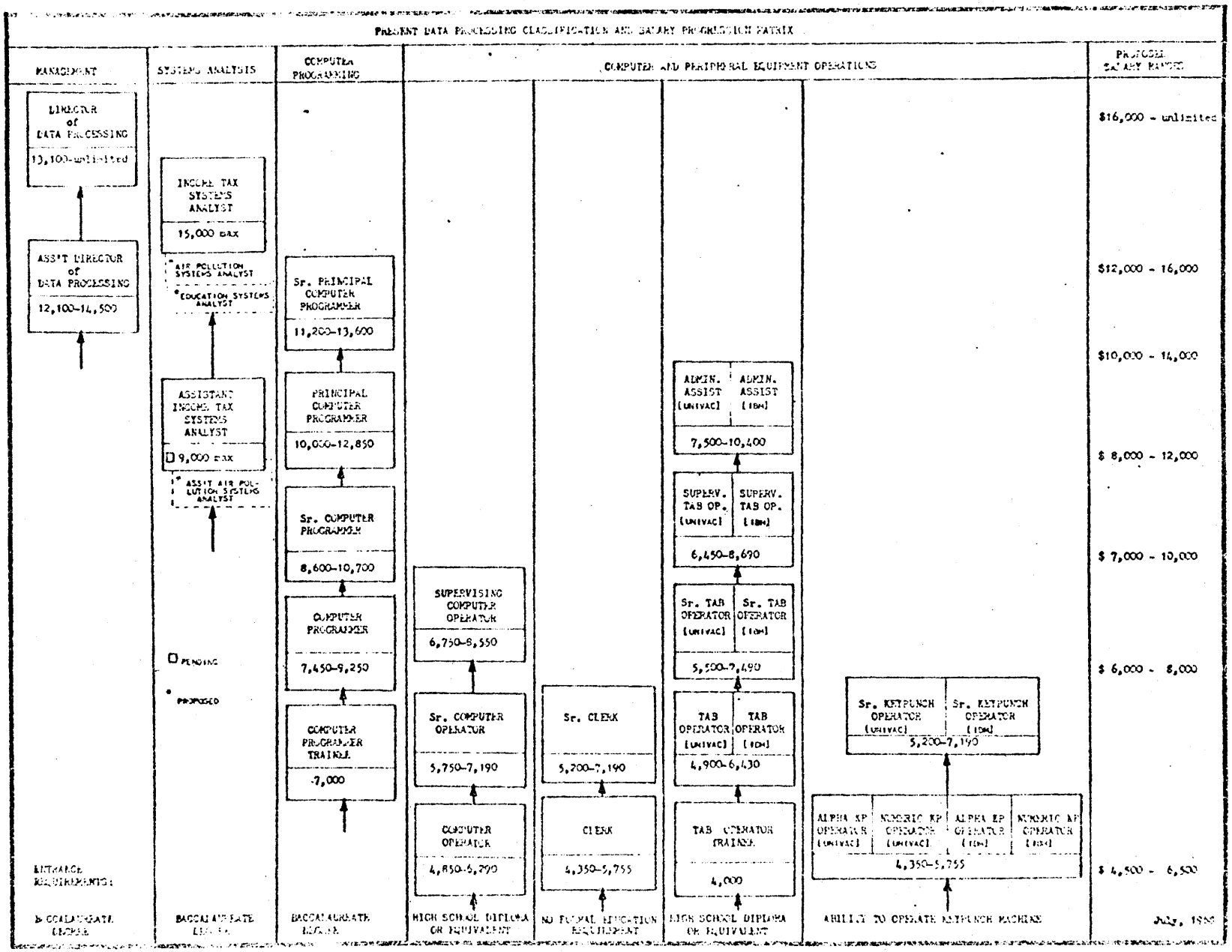

PRESENT DATA PROCESSING CLASSIFICATION AND SALARY PROGRESSION MATRIX
MANAGEMENT
SYSTEMS ANALYSTS
COMPUTER PROGRAMMING
COMPUTER AND PERIPHERAL EQUIPMENT OPERATIONS
PRESENT SALARY RANGES
DIRECTOR of DATA PROCESSING
13,100-unlimited
ASS'T DIRECTOR of DATA PROCESSING
12,100-14,500
INCOME TAX SYSTEMS ANALYST
15,000 max
AIR POLLUTION SYSTEMS ANALYST
EDUCATION SYSTEMS ANALYST
ASSISTANT INCOME TAX SYSTEMS ANALYST
9,000 max
ASS'T AIR POLLUTION SYSTEMS ANALYST
PENDING
PROPOSED
Sr. PRINCIPAL COMPUTER PROGRAMMER
11,200-13,600
PRINCIPAL COMPUTER PROGRAMMER
10,000-12,850
Sr. COMPUTER PROGRAMMER
8,600-10,700
COMPUTER PROGRAMMER
7,450-9,250
COMPUTER PROGRAMMER TRAINEE
7,000
SUPERVISING COMPUTER OPERATOR
6,750-8,550
Sr. COMPUTER OPERATOR
5,750-7,190
COMPUTER OPERATOR
4,850-6,290
Sr. CLERK
5,200-7,190
CLERK
4,350-5,755
ADMIN. ASSIST (UNIVAC)
ADMIN. ASSIST (IBM)
7,500-10,400
SUPERV. TAB OP. (UNIVAC)
SUPERV. TAB OP. (IBM)
6,450-8,690
Sr. TAB OPERATOR (UNIVAC)
Sr. TAB OPERATOR (IBM)
5,500-7,490
TAB OPERATOR (UNIVAC)
TAB OPERATOR (IBM)
4,900-6,430
TAB OPERATOR TRAINEE
4,000
Sr. KEYPUNCH OPERATOR (UNIVAC)
Sr. KEYPUNCH OPERATOR (IBM)
5,200-7,190
ALPHA KP OPERATOR (UNIVAC)
NUMERIC KP OPERATOR (UNIVAC)
ALPHA KP OPERATOR (IBM)
NUMERIC KP OPERATOR (IBM)
4,350-5,755
$16,000 - unlimited
$12,000 - 16,000
$10,000 - 14,000
$ 8,000 - 12,000
$ 7,000 - 10,000
$ 6,000 - 8,000
$ 4,500 - 6,500
ENTRANCE REQUIREMENTS:
BACCALAUREATE DEGREE
BACCALAUREATE DEGREE
BACCALAUREATE DEGREE
HIGH SCHOOL DIPLOMA OR EQUIVALENT
NO FORMAL EDUCATION REQUIREMENT
HIGH SCHOOL DIPLOMA OR EQUIVALENT
ABILITY TO OPERATE KEYPUNCH MACHINES
July, 1965

Exhibit 17

below in the same occupational group. Movement from one occupational group to another, as a promotion or even laterally, is dependent upon the applicant's eligibility for open competitive examinations. However, above entrance level, such examinations are usually offered only when it is estimated that the list resulting from the usual "straight up" promotion examination will not produce enough applicants to fill the vacant positions for which it is being promulgated.

Current Civil Service requirements for entrance to programming include a college degree, although advances in programming languages, hardware and software indicate that this level of education is no longer necessary for proficient programming performance.

Titles for keypunch and tab operations people still include specific equipment manufacture designations and, at the entrance level for keypunch operator, equipment operator classification titles are fragmented further by the use of separate alpha and numeric designations. No title exists at present for a supervisory level in the keypunch series.

The recommendations that follow are designed to provide the City with the viable structure necessary to support all of its present and forecasted DP activities. The recommended titles, related career paths, and approximate salary ranges (the last is provided here for comparative purposes only), are presented in Exhibit 18. To accomplish its DP personnel objectives, the City must:

1. Establish Computer Systems Analysis series of positions, separate from the Computer Programmer series.

2. Provide an entrance salary for the Computer Systems Analysis series above the level for entrance to the Programming series.

3. Establish a Computer Software Systems Analysis title.

4. Provide for alternate paths of promotion.

    a. from Programming to Computer Systems Analysis.

    b. from Programming to Computer Software Systems Analysis.

    c. from Computer Operations to Computer Programming series.

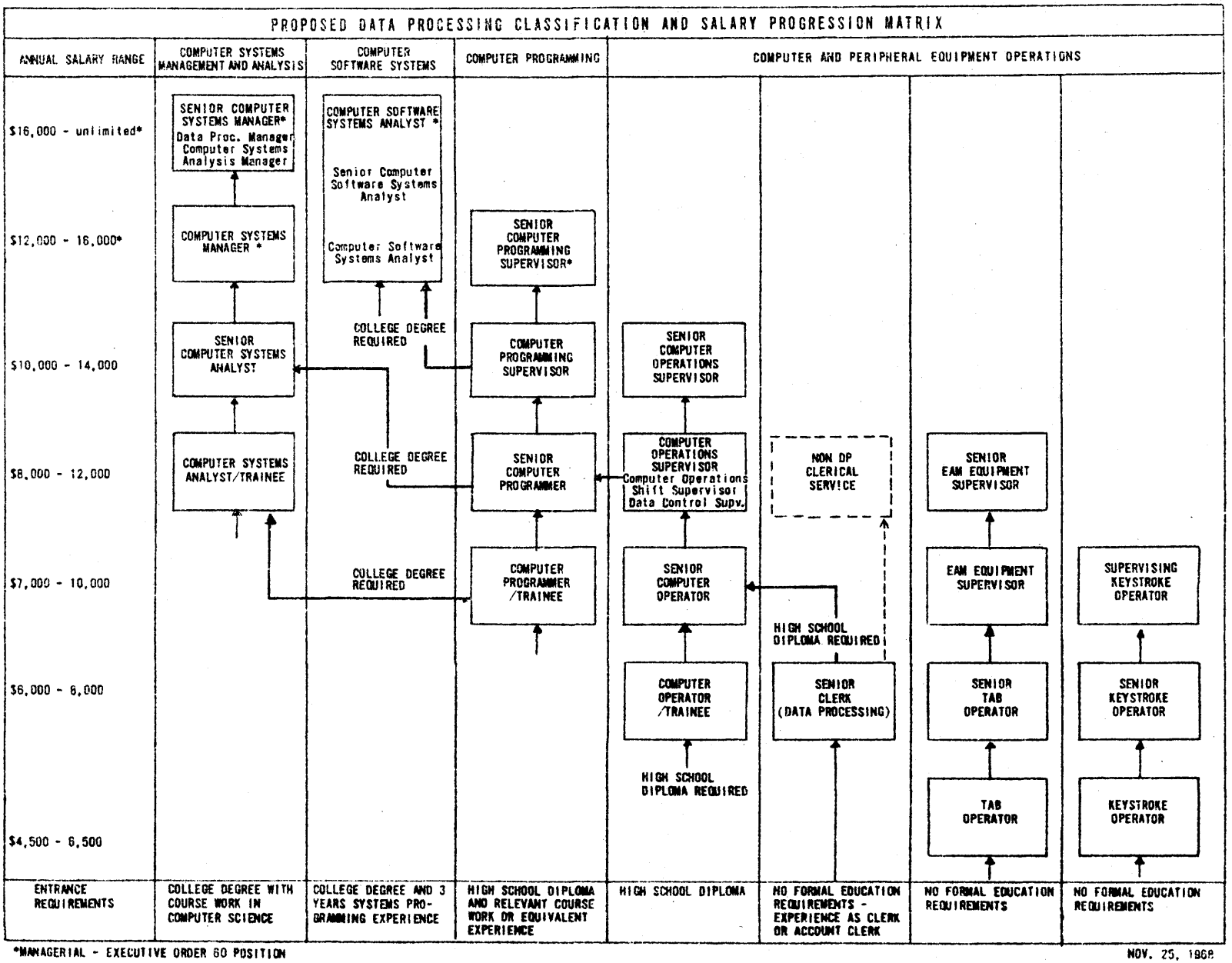

PROPOSED DATA PROCESSING CLASSIFICATION AND SALARY PROGRESSION MATRIX
ANNUAL SALARY RANGE
COMPUTER SYSTEMS MANAGEMENT AND ANALYSIS
COMPUTER SOFTWARE SYSTEMS
COMPUTER PROGRAMMING
COMPUTER AND PERIPHERAL EQUIPMENT OPERATIONS
$16,000 - unlimited*
$12,000 - 16,000*
$10,000 - 14,000
$8,000 - 12,000
$7,000 - 10,000
$6,000 - 8,000
$4,500 - 6,500
SENIOR COMPUTER SYSTEMS MANAGER*
Data Proc. Manager
Computer Systems Analysis Manager
COMPUTER SYSTEMS MANAGER *
SENIOR COMPUTER SYSTEMS ANALYST
COMPUTER SYSTEMS ANALYST/TRAINEE
COMPUTER SOFTWARE SYSTEMS ANALYST *
Senior Computer Software Systems Analyst
Computer Software Systems Analyst
COLLEGE DEGREE REQUIRED
COLLEGE DEGREE REQUIRED
COLLEGE DEGREE REQUIRED
SENIOR COMPUTER PROGRAMMING SUPERVISOR*
COMPUTER PROGRAMMING SUPERVISOR
SENIOR COMPUTER PROGRAMMER
COMPUTER PROGRAMMER /TRAINEE
SENIOR COMPUTER OPERATIONS SUPERVISOR
COMPUTER OPERATIONS SUPERVISOR
Computer Operations Shift Supervisor
Data Control Supv.
SENIOR COMPUTER OPERATOR
COMPUTER OPERATOR /TRAINEE
HIGH SCHOOL DIPLOMA REQUIRED
NON DP CLERICAL SERVICE
HIGH SCHOOL DIPLOMA REQUIRED
SENIOR CLERK (DATA PROCESSING)
SENIOR EAM EQUIPMENT SUPERVISOR
EAM EQUIPMENT SUPERVISOR
SENIOR TAB OPERATOR
TAB OPERATOR
SUPERVISING KEYSTROKE OPERATOR
SENIOR KEYSTROKE OPERATOR
KEYSTROKE OPERATOR
ENTRANCE REQUIREMENTS
COLLEGE DEGREE WITH COURSE WORK IN COMPUTER SCIENCE
COLLEGE DEGREE AND 3 YEARS SYSTEMS PROGRAMMING EXPERIENCE
HIGH SCHOOL DIPLOMA AND RELEVANT COURSE WORK OR EQUIVALENT EXPERIENCE
HIGH SCHOOL DIPLOMA
NO FORMAL EDUCATION REQUIREMENTS - EXPERIENCE AS CLERK OR ACCOUNT CLERK
NO FORMAL EDUCATION REQUIREMENTS
NO FORMAL EDUCATION REQUIREMENTS
*MANAGERIAL - EXECUTIVE ORDER 60 POSITION
NOV. 25, 1968

Exhibit 18

d. from Senior Clerk (Data Processing) to the Computer Operator series as well as to the higher level non-DP clerical services.

5. Lower the education eligibility requirements from college degree to high school diploma for entrance into the Programmer series.

6. Establish two supervisory levels in the Programming series.

7. Establish a titled Senior Computer Operator Supervisor.

8. Permit a Computer Operator Supervisor to function as either Shift Supervisor or Data Control Supervisor.

9. Establish a special clerical title, Senior Clerk (Data Processing).

10. Replace obsolete vendor oriented EAM titles with more general Supervisor, EAM Equipment titles and Tab Operator titles.

11. Establish two supervisory levels in the EAM Equipment operation series.

12. Replace obsolete vendor oriented Keypunch titles with a more general Keystroke Operator designation.

13. Establish Supervising Keystorke Operator titles.

RECRUITING

The following recommendations are designed to improve the City's position in the highly competitive DP personnel market:

1. Expand general on-campus recruiting program to make students with an interest in DP aware of NYC government's DP career opportunities.

2. Extend recruiting of the same nature to professional DP organizations.

3. Undertake on-site high school and community college recruiting similar to that recommended for colleges, to acquaint these students with

lowered entrance requirements for programming positions.

4. Give consideration to programs for the disadvantaged as a source for keystroke and computer operators.

5. Expand advertising media lists to include business, DP professional and DP trade publications.

6. Continue to improve examining and certifying process to further close the time gap between initial contact and appointment.

7. Hold open competitive examinations concurrently with promotion examinations.

8. Hold walk-in examinations.

9. Modify the testing process to permit greater use of unassembled examinations.

10. Establish large panels of qualified examiners from which to draw, on short notice, small panels needed to implement recommendations 8 and 9.

11. Encourage DP line managers and all DP personnel to become involved in the DP recruiting effort. Their objective should be to sell the merits of City employment as well as assist in the evaluation of candidates.

TRAINING

Since the DP personnel supply will continue to be inadequate in the projectable future, the City cannot rely solely on improved recruiting procedures but must also design and implement a comprehensive training program to develop qualified DP managers and technicians to fill its current and future needs. To meet its data processing training needs, the City should:

1. Develop and implement a continuing program of regular DP training courses directed to teaching and updating skills for all levels of DP personnel.

2. Develop and implement a training program for non-DP managers who are, or may become, DP users.

3. Coordinate courses offered by equipment vendors and Department of Personnel with specially developed courses as outlined in this report.

4. Encourage individual participation in voluntary and after-hours education programs.

5. Provide funds to enable attendance at professional conferences, workshops and seminars.

A tabular presentation of the relationship between recommended courses and DP positions is presented in Exhibit 19.

MAINTENANCE OF RECOMMENDED PERSONNEL PLAN

Implementation of the following recommendations is most critical for long range success of the Information Systems Plan:

1. Conduct an annual comprehensive review.

   a. Citywide DP personnel requirements.
   b. DP personnel position classifications.
   c. DP personnel salary ranges.
   d. DP personnel alternate career paths.
   e. DP personnel recruiting program and its effectiveness.

2. Assign responsibility to the City's Information Systems DP Planning group for planning and carrying out the annual reviews listed above, and for working with the Department of Personnel, Bureau of the Budget, and other relevant City agencies to implement whatever changes are required.

ACHIEVEMENT OF INFORMATION SYSTEMS OBJECTIVES

Because of the romance associated with data processing hardware and software, great emphasis in the computer industry has been placed on computer equipment. However, meaningful accomplishment is predicated on personnel capabilities. If the Information Systems Action Program is going to succeed in its goal of assisting City agencies to take full advantage of modern information technology, the City must attract and retain qualified DP personnel. Implementation of the major recommendations in this report is fundamental to the achievement of these objectives.

PROPOSED DATA PROCESSING TRAINING MATRIX

POSITION \ COURSE	101 ORIENTATION AND BASIC CONCEPTS-OPERATIONS PERSONNEL	102 COMPUTER AND PERIPHERAL EQUIPMENT OPERATIONS	103 PROFESSIONAL UPDATE - OPERATIONS PERSONNEL & PERIPHERAL EQUIPMENT	104 SUPERVISING COMPUTER OPERATIONS	105/205 STANDARDS MANUAL ORIENTATION - I	201 ORIENTATION AND BASIC COMPUTER PROGRAMMING	202 ORIENTATION AND BASIC SYSTEMS ANALYSIS	203 OPERATING SYSTEMS TECHNIQUES	204 PROFESSIONAL UPDATE - MANAGEMENT & SYSTEMS PERSONNEL MANAGING DATA PROCESSING ACTIVITIES	301 STANDARDS MANUAL ORIENTATION II	302/402 BASIC CONCEPTS FOR NON-DP MANAGERS	401
MANAGERS - NON - EDP										X	X	
COMMISSIONERS DEPUTIES & OTHER DP DECISION MAKERS									X	X		
SENIOR COMPUTER SYSTEMS MANAGER								X	X	X		
COMPUTER SYSTEMS MANAGER								X	X	X		
SENIOR COMPUTER SYSTEMS ANALYST							O	X		X		
COMPUTER SYSTEMS ANALYST							O	X		X		
COMPUTER SYSTEMS ANALYST TRAINEE						O	X	X		X		
COMPUTER SOFTWARE SYSTEMS ANALYST								X	X	X		
SENIOR COMPUTER PROGRAMMING SUPERVISOR								X	X	X		
COMPUTER PROGRAMMING SUPERVISOR								O	X	X	X	
SENIOR COMPUTER PROGRAMMER					X		O		X		X	
COMPUTER PROGRAMMER					X		O		X		X	
COMPUTER PROGRAMMER TRAINEE					X	X			X		X	
SENIOR COMPUTER OPERATIONS SUPERVISOR		X	X	X	X						X	
COMPUTER OPERATIONS SUPERVISOR		X	X	X	X	O					X	
SENIOR COMPUTER OPERATOR		X	X		X						X	
COMPUTER OPERATOR		X	X		X						X	
COMPUTER OPERATOR TRAINEE	X	X	X		X						X	
SENIOR CLERK (DATA PROCESSING)	X	X	X		X							
SENIOR EAM EQUIPMENT SUPERVISOR		X	X	X	X							
EAM EQUIPMENT SUPERVISOR		X	X	X	X							
SENIOR TABULATING OPERATOR		X	X		X							
TABULATING OPERATOR	X	X	X		X							
SUPERVISING KEYSTROKE OPERATOR		X	X	X	X							
SENIOR KEYSTROKE OPERATOR		X	X		X							
KEYSTROKE OPERATOR	X	X	X		X							

X = Recommended Course
O = Parts of this course should be made available as indicated in course specifications

IX. DATA PROCESSING STANDARDS PROGRAM

INTRODUCTION

The City has been making and will continue to make huge investments in equipment, application systems and training of people associated with computer systems. The scale of the investment dictates the need for a more structured approach to the whole data processing system life cycle (illustrated in Exhibit 20). A well developed and executed DP standards program has been generally recognized by DP professionals as a practical and effective way to gain continued benefit from major DP investments in DP systems. Until recently, only the minimum need of a few agencies were met and the others without standards continued to operate with marginal effectiveness.

DP STANDARDS MANUAL

As part of this project, a draft version of a DP Standards Manual for the City of New York has been prepared. The City Administrator's staff and the Consultants developed the City of New York Data Processing Standards Manual. IBM Corporation personnel provided considerable assistance in the development of the section on operating methods.

A major objective of this project activity was to build from the proven needs of other DP organizations. Therefore, much of the material included in the manual is based on a review of a large number of DP standards manuals of organization in both the public and private sectors. In particular, the City of New York's Technical Advisory Panel on Information Systems (TAPIS), a volunteer group representing industry expertise in DP, contributed a number of standards manuals.

The completed draft of the DP Standards Manual represents a significant step forward in the state of the art of data processing standards. Nonetheless, recognizing both how far the state of the art is from satisfying the practical requirements of DP operating personnel and how dynamic DP technology is, the manual is structured to facilitate its change. Also it is recognized as only the first step in a continual program dedicated to closing the gap between state of the art and agency DP standards requirements.

The DP Standards Manual was designed to cover DP policies, procedures, documentation and methodology. In general, it is a working level guide to the conduct of the various aspects of the data processing function. Many of the procedures include detailed forms for documenting

THE CITY OF NEW YORK Data Processing Standards

DATE ISSUED	SUBJECT	STANDARD NO.
3/27/69	DEVELOPMENT OF NEW SYSTEM	05.08
		PAGE 3 OF

COMPUTER SYSTEMS PROJECT LIFE CYCLE

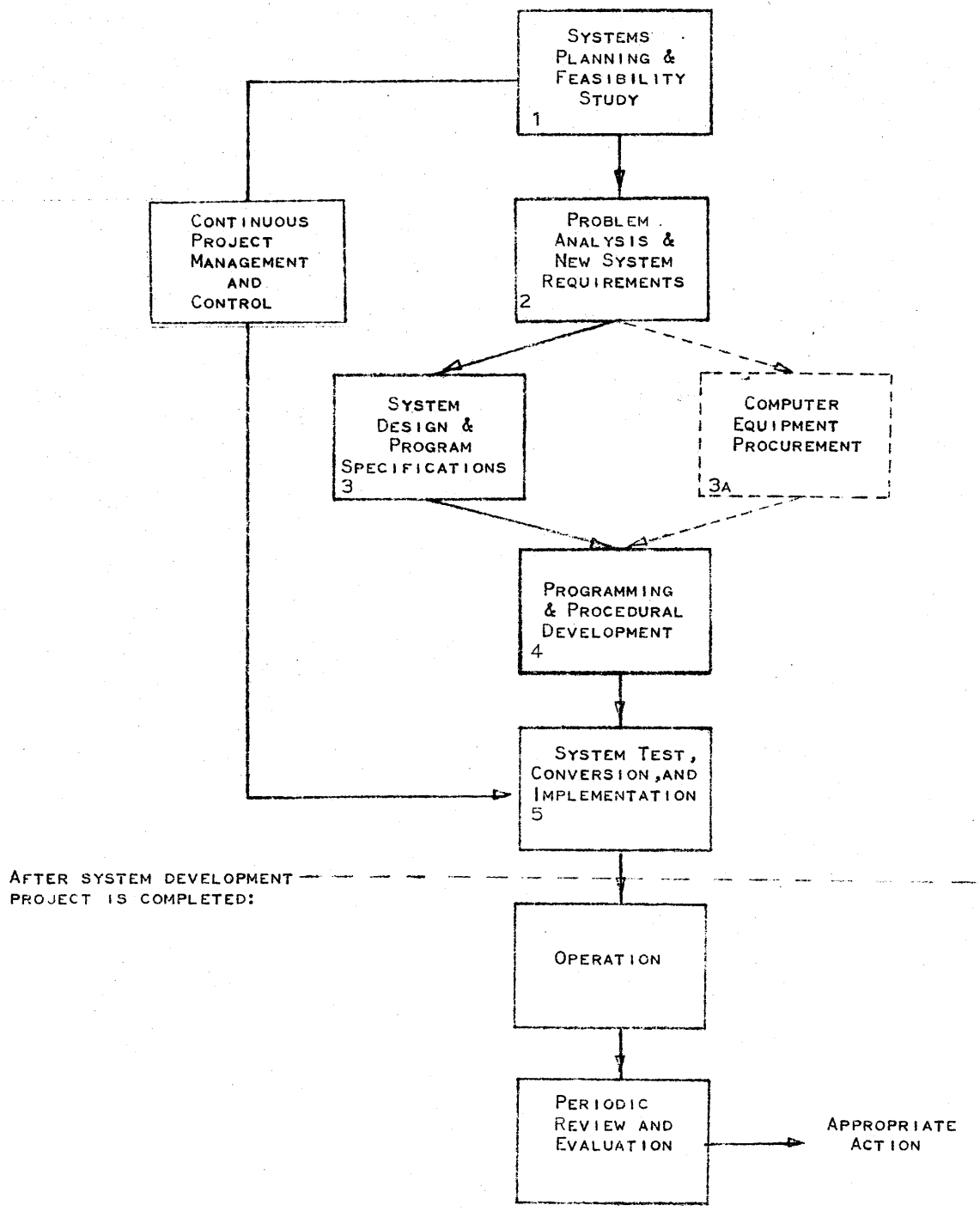


FIGURE 05.08-2

the processes discussed. A condensed version of it is being developed for those sections of the manual which should be considered minimum standards for all City data processing operations.

BENEFITS FROM DP STANDARDS

Some of the DP standards advantages are:

1. Computer programs and applications developed for one agency can be used by others with little or no modification, thereby avoiding multiple development costs.

2. Standardized operations can be shifted between installations to smooth peak loads, allowing reduction in size and cost of each installation.

3. By documenting management's definitions of systems requirements early in the development process, the high cost and frustration associated with guessing what management said they wanted can be significantly reduced.

4. More equitable treatment of vendors through the introduction of a more structured approach to the development and evaluation of equipment and systems development specifications used in the purchase of computer equipment and services.

5. Changes in the system can be made more easily.

6. Hardware changes can be made with only minor reprogramming costs if standard machine-independent programming languages are used.

7. Flexibility of personnel assignments can be enhanced and the problems of employee promotion or turnover reduced since the operation of a data processing organization will not be dependent on the undocumented knowledge of one or two people.

8. Management will be able to make more informed decisions regarding data processing and information systems proposals because proposals will be better documented, areas to be considered by management will be more clearly identified,

and continually closer approximations of systems costs/benefits will be known at successive management review points in the systems development process.

9. The availability of standard documentation will facilitate more effective use of scarce technical skills of DP personnel.

10. Management will be better able to specify and control the work performed by consultants.

In addition to the above advantages, the Standards Manual is a valuable resource for formal training programs as well as on the job training. Much of the proposed DP training program, outlined in Volume IV of the project reports, is built around the DP Standards Manual.

ORGANIZATION FOR STANDARDS

Because standards are subject to constant revision and are considered as an overhead activity, development and maintenance of standards should be removed from the day-to-day pressures of an installation and assigned to a central staff function. In this way, a single staff services all users at a minimum cost to each.

This objective can be realized with the establishment of the Information Systems Program Planning group. It should be staffed with technical capability to perform this standards function. Staff members of the Office of Administration are currently carrying on the function.

Central data processing personnel in the Information Systems Planning group are staff personnel and their function is to support City agencies. Nonetheless, the operating Administration should designate someone in its DP organization to manage the Administration's DP standards effort. Unless such a person is designated, the resources of central staff will not be effectively used.

The connecting link between the central DP standards staff and operating agencies is the DP Standards Task Force. Under the guidance of the Office of Administration, the draft version of the DP Standards Manual has been distributed for review and modification by a DP Standards Task Force consisting of DP representatives from Bureau of the Budget, Comptroller, Department of Education, Finance Administration, Human Resources Administration, Department of Personnel, and the Police Department.

The use of a DP Standards Task Force is fundamental to a successful DP standards program. It provides a vehicle for working level, practical review of standards developed by the central staff as well as a source for new or revised DP standards. Consequently, the involvement of the line DP personnel increases their appreciation for the DP standards developed, and through their contribution increases the probability of their practical use. In addition to initiating new standards, one purpose of the central staff is to provide qualified personnel to fully develop standards initiated by the Task Force.

CONTINUING DP STANDARDS PROGRAM

As a major part of its responsibility, the Information Systems Planning group will manage a continuous standards program. In addition to support of the DP training program and the continued development of the DP Standards Manual, it should:

1. Publish and distribute DP standards forms and instructions to facilitate use of DP standards by agency DP personnel.

2. Prepare Executive Orders, Administrative Directives and related official communications to promulgate official DP standards for the City of New York.

3. Cooperate in the standards work of professional organizations outside the City of New York, such as the United States of America Standards Institute.

4. Participate in the development of intergovernmental DP standards with the State of New York, the Federal Government and such groups as the Intergovernmental Task Force on Information Systems.

5. Cooperate with industry through such organizations as the Technical Advisory Panel on Information Systems to facilitate exchange of technical information with locally based industry.

6. Place highest priority on assistance to City agencies in the solution of the problems related to DP standards.

The last item will assure performance as a service agency, and continually develop the technical capabilities of the central staff essential to quality performance.

X. IMPLEMENTING THE ACTION PROGRAM

INTRODUCTION

The purpose of this chapter is to summarize the major action steps which the Project Staff believes are required to implement the recommended DP plan, to identify the agencies responsible, and to provide a reference to the appropriate section of the basic project technical documentation: Information Systems for the City of New York, Volume II, An Action Program for Management - Technical Report.

The Project Staff recommends that high priority be given to executing all of the recommended action steps listed below. However, because the other action steps are dependent upon the resolution of organizational responsibility, organizing to perform primary DP functions is presented as the highest priority for action.

ORGANIZE TO PERFORM PRIMARY DATA PROCESSING FUNCTIONS

Action Steps

The Project Steering Committee reviews final project documentation and:

1. Identifies areas of consensus.

2. Makes action recommendations to the Mayor through the Project Steering Committee and as appropriate, through the member's respective superiors.

As requested, members of the Project Team brief the Mayor on the projects.

The Mayor, based on his review of the above and related information, including the Consultant's recommendations, selects alternatives which he believes should be implemented and executes appropriate executive orders, administrative directives and funding requests to establish the organization and to assign responsibilities for:

a. Information Systems Planning group
b. Citywide Data Systems groups
c. Central Data Processing Service Center
d. New York Information Systems - Policy Advisory Council
e. Technical Advisory Panel on Information Systems

References

Chapters III, IV, V, VI, VII and VIII
Appendix B., C., D., and E.

PROVIDE INFORMATION SYSTEMS PIANNING

Action Steps

The Agency responsible for the Information Systems Planning group, and the Policy Advisory Council perform responsibilities assigned to them by the actions of the Mayor.

The Information Systems Planning group communicates the Information Systems Plan to City agencies by publishing appropriate reports and conducting executive, management and technical briefings.

As supported by continuing analysis, the Information Systems Planning group proceeds to implement the strategy for deploying DP resources defined in the Plan.

Through the DP Personnel Program, the DP Standards Program and their technical support activities, the Information Systems Planning group devotes major management attention to the continued development (consistent with the plan) of DP planning capability in City agencies.

References

Chapter V and VIII, and Appendix F.

PIAN AND DEVELOP CITYWIDE DATA SYSTEMS

Action Steps

The agencies responsible for the Internal and External Citywide Data Systems groups perform the responsibilities assigned to them by the actions of the Mayor.

The groups give highest priority to the Personnel Data Sub-system of the Internal Resource Data System and to the Real Property Sub-system of the External Data Systems.

Reference

Chapter VI

PROVIDE CENTRAL DATA PROCESSING SERVICES

Action Steps

The agency responsible for the Central Data Processing Service Center performs responsibilities assigned to it by the actions of the Mayor.

It gives high priority to recruiting a Central DP Service Center Director. Following his selection, he takes immediate steps to develop and implement a detailed plan for the Central DP Service Center.

The Mayor, through the budget, provides adequate financial, managerial and technical resources to the initial DP Service Center to make it an effective alternative source of DP resources for City agencies.

The agency with information systems planning responsibility provides management and technical assistance to the Central DP Service Center Director. Such assistance is essential to provide continuity between this project and the start-up of the Central DP Service Center.

References

Chapter VII and Appendix D.

CONTINUE THE DATA PROCESSING PERSONNEL PROGRAM

Action Steps

The Department of Personnel, the Bureau of the Budget and the Mayor complete the necessary personnel orders to implement the remainder of the DP personnel classification changes recommended by the Project Team and approved by the Project Steering Committee.

The Information Systems Planning group performs DP personnel activities which supplement those of other staff agencies and which are consistent with the responsibility assigned by the actions of the Mayor. The group gives high priority to recruiting of key personnel for agencies and assisting the agencies to organize appropriately for DP activities.

References

Chapter IX and Appendix G-2.

CONTINUE THE DATA PROCESSING STANDARDS PROGRAM

Action Steps

The Office of Administration and the DP Standards Task Force complete their review of the DP Standards Manual draft and develop recommendations for mandatory DP standards.

In addition to publishing the DP Standard Manual, the agency assigned Information Systems Planning responsibility by action of the Mayor issues and enforces mandatory DP standards.

Reference

Chapter X and Appendix G-1.